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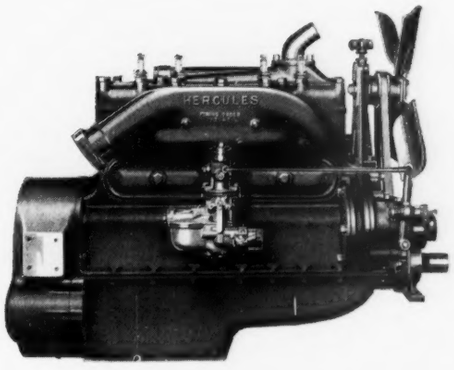
Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Chicago, August 31, 1929 (*Issued Every Other Week*) Volume XXXII, No. 18

HERCULES ENGINES



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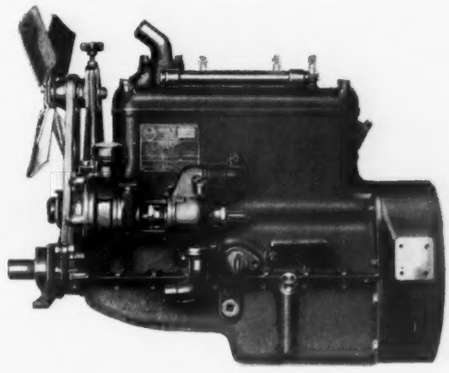

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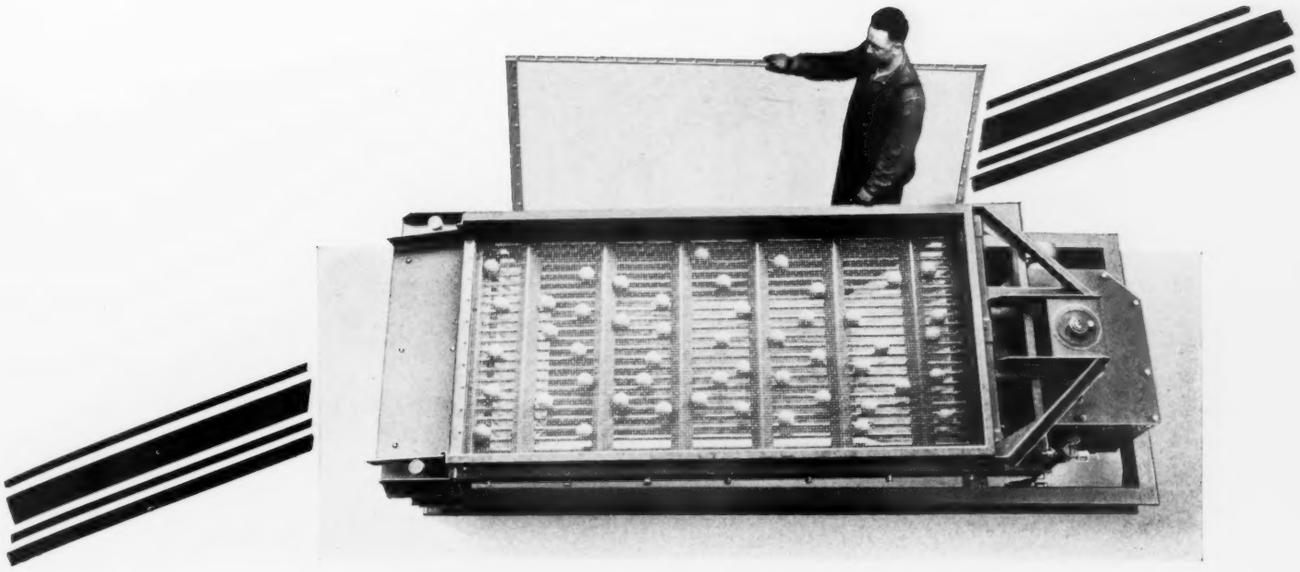

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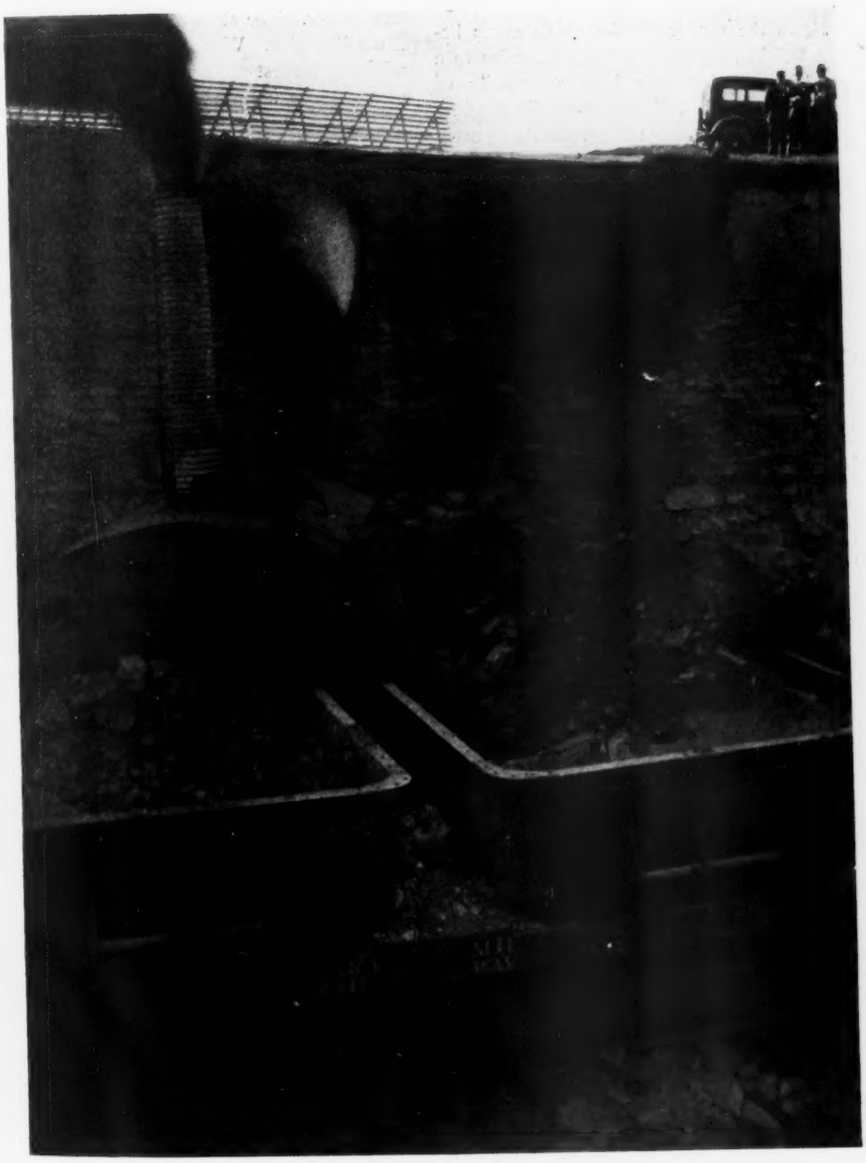


Quarry of the Monolith Portland Midwest Co. at Laramie, Wyo., where natural cement rock is found in great quantities and in almost ideal proportions—A description of the operation will be found on the succeeding pages

Some Features of This Issue

Monolith Cement Plant—Why should one of the most modern portland cement mills be built in such a sparsely settled state as Wyoming? A visiting editor attempts to answer this question as well as furnish a very complete description of the plant itself.

Rock Products Industry of Texas—An empire in itself is the state of Texas, and its possibilities appear immense. While not undergoing any boom, industrial progress there is making great strides. Producers of rock products are proving their faith in the future by extensive investments in improvements and new projects.

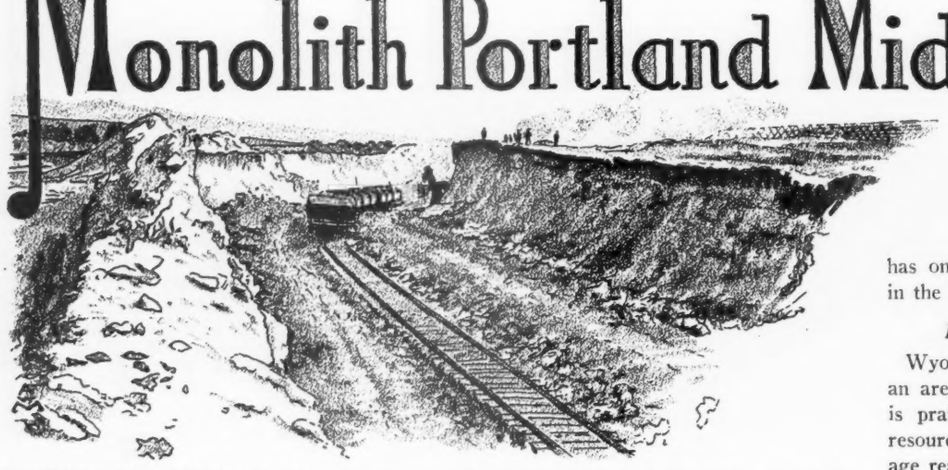
The Not-So-Common Rock Products—Two articles deal with some of many rock products little in numerical importance but not to be overlooked in the economy of industry in general—silica and ochre.

Air Receiver Explosions—A hazard frequently overlooked by quarry operators, in the opinion of a ROCK PRODUCTS editor who has visited many quarries, is discussed by an expert.

Tests of Concrete Aggregates—Aggregates are the particular hobby of at least one editor; and all that's new in tests and developments that editor just "eats up." In this issue he discusses what the recent report of comparative tests of stone and gravel concrete aggregates mean, from his experienced point of view.

A "Frictionless" Gravel Plant—Here is a story on a new Ohio sand and gravel plant which has eliminated friction in machinery and equipment so far as it is possible to do so, it would seem.

Monolith Portland Midwest Co's.



BEFORE PROCEEDING with a description of the "Monolith Unit No. 2" it might be well to briefly outline the previous history of the older and what might be called the parent company of this newer subsidiary known as the Monolith Portland Midwest Co., so that the reader will have an insight into some of the reasons why the older Monolith Portland Cement Co. of Monolith, Calif., has been successful enough to have subsidiaries.

The plant at Monolith, Calif., was built in 1913 by the city of Los Angeles for the purpose of supplying cement for the aqueduct that delivers water from the Owens valley to the city of Los Angeles for domestic purposes. This aqueduct was one of the outstanding engineering feats of the time; and owing to the fact that the water was delivered through a desert region for ap-approximately 100 miles, beginning nearly at the foot of Mount Whitney, the highest point in the United States, down through the Mojave desert and into Los Angeles, a large amount of cement was used. The plant had a capacity of 1000 bbl. per day; and while operated by the city politicians of Los Angeles it showed an increasing yearly loss, not allowing either for the plant deterioration. In 1918 the plant was sold to the United States Potash Co., which operated it until 1920 with indifferent success, finally disposing of its holdings to the present owners that year.

From the very start the new owners began building up the plant and its sales to a point where they how have a capacity of 4000 bbl. per day. The growth in production can be seen from the following yearly shipments:

1921	320,035 bbl.
1922	426,106 bbl.
1923	600,625 bbl.
1924	830,197 bbl.
1925	1,113,331 bbl.
1926	1,356,264 bbl.
1927	1,445,793 bbl.

The firm of F. L. Smidth and Co., New York City, was employed to design and supervise the construction of the second Monolith plant. The Macdonald Engineering Co., Chicago, did the actual construction work as contractors.

In 1928 construction work was started on the new unit and early in 1929 the plant was placed in operation. The plant was built about 2½ miles southwest of Laramie, alongside of the Union Pacific R. R. main line, between Omaha and San Francisco. The neat and architecturally pleasing appearance of this plant, surrounded by broad expanse of virgin western prairie, would excite comment from anyone passing. The highway between Wyoming points and Denver also passes the plant so that a host of travelers daily are reminded that Wyoming has one of the most modern cement plants in the United States, if not in the world.

Looking down into the cement rock quarry

Markets—Present and Future

Wyoming has a population of 240,000 and an area of 62,430,720 acres, most of which is prairie or mountainous, but its natural resources are hardly appreciated by the average reader. The state is 365 miles long and 276 miles wide. Wyoming has been credited with the largest tonnage of bituminous coal of any state in the Union. Its oil production is being held back purposely by the larger producers. It is second in wool production and has enormous oil shale deposits as well as iron ores, potash and alumina deposits and large forests of virgin timber. Colorado and Nebraska are also states served by this new plant, and it was estimated that in 1927 these states consumed 3,000,000 bbl. of cement, of which 1,300,000 would have a favorable if not a preferential freight rate from a plant located at Laramie.

The state of Wyoming recently increased its gasoline tax from 2 to 3 c., so that eventually some concrete highway work will be undertaken. Nebraska is planning to build the Lincoln highway of concrete the entire length of the state, and it is possible that with federal aid Wyoming may do likewise.

At present the outlets for standard cement will be in the vicinity of Denver, Salt Lake City and the larger mid-western cities, although the Monolith waterproof plastic product, which is this company's specialty, can be shipped into Omaha and other Missouri river points.

The mill and quarry operate on 8-hour shifts. All of the company employes live in or near Laramie, as the company does not maintain a boarding house or commissary. About 100 men are employed for the quarry and mill operation, including the shop, office, laboratory, etc. This economical operation is possible because of a well-designed plant requiring a minimum of labor, fuel, power and equipment, and also because of a remarkable deposit of cement rock.

It will be noted from the layout of the plant that additional equipment can be added without interfering with the normal operation of the plant.

Monolith Cement Characteristics

The Monolith Portland Midwest Co. manufactures two kinds of cement, the Monolith plastic waterproof portland cement and

New Plant at Laramie, Wyoming

General view of the Monolith Portland Midwest Co.'s modern wet-process cement mill at Laramie, Wyo.

standard portland cement. Both cements pass the portland cement tests of the American Society for Testing Materials, with the additional advantage, in the case of the plastic cement, of having easily recognizable plastic and waterproof properties. The ingredients are ground into the clinker at the finish "Unidan" mill to insure thorough incorporation.

The manufacturers claim that 30 to 35 shovels of sand to one sack of plastic cement, as compared to 15 to 18 for ordinary cement, for exterior plaster, produce a harder and stronger wall, free from cracks. This property has been recognized on the West Coast by the manufacturers of California stucco, a very popular building material in that section.

There are no data available of a technical nature to prove these points, for the reason that to date there has been developed no satisfactory means of measuring plasticity. The company expects, however, to install a machine for determining the relative absorption and waterproofing qualities of its material. This machine will subject a concrete slab to a definite hydraulic pressure for a given time, after which the slab will be broken and the depth to which the water has been absorbed will indicate its comparative waterproofing ability.

A remarkable feature of this waterproofed cement is that the tensile and compressive strengths are both increased by the ingredients added. Also from the following table it will be seen that this cement has a very high early strength, which is attributed to the nature of the limestone used, which is easily and completely disintegrated. For comparison both the tensile and compressive strengths of plastic and portland cements are given:

TENSILE STRENGTH	Ordinary	Plastic
3-day	330-350	400
7-day	420	500
28-day	460	550
COMPRESSIVE STRENGTH		
3-day	3300	3600
7-day	4600	5000
28-day	6600	7200

Quarry

The deposit has about 2 ft. of overburden, consisting of prairie sod and loam, which is removed under contract by a local contractor. The site chosen for opening up of the new quarry is along a low bluff bordering the Little Laramie river, the upper portion of the bluff being slightly dome-shaped. The overburden is plowed and loaded into dump wagons by an excavator made by the Red Digger Manufacturing Co. This type of excavator is drawn by horses or tractors and is much used throughout the western sections of the United States, particularly for railroad grading, but its use for quarry stripping is rather unusual.

The face of the quarry has been opened up for a length of approximately 1700 ft., with a height of 25 to 30 ft. The company, before proceeding with its plans, thoroughly tested the deposit by sinking test pits, showing the deposit to be extremely thick and remarkably uniform. Some of the tests pits and drill holes were bottomed at 150 ft. and were still in limestone, so there is no question as to the quantity or quality of the deposit. The quarry operation is conducted from a single bench. Snow fences, of the type so familiar to one traveling over the western railroads, protect the quarry from the heavy snow falls in that district. This feature of the quarry is novel.

The stone is the Niabara limestone, and as revealed in this deposit is a highly shattered and disintegrated material, the deposit apparently having undergone movements after its deposition shattering the stratified material until most of the rock pieces are smaller than one-man stone. Owing to this feature it is not necessary to do blasting, either primary or secondary; the 1-yd. Marion steam shovel used for loading can very easily dig the material as it stands.

Part of the company personnel. Left to right: Wallace Malcolm, W. G. Smith, E. W. Joop, George M. Wilson, Earle Daniels, Judge W. H. Hayes, W. E. Anderson, Charles H. Hopkins, George F. Sheran, John G. Bergmann, R. W. Harper and R. W. Anderson

Storage silos at the newest cement producing unit in the west

The overburden is plowed and loaded to dump wagons by excavators of this type

This feature is one of many that will keep production costs at this plant below normal.

Not only is the limestone easy to quarry, but it crushes very easily also, the stone being by nature very soft, resembling in this respect the limerock of Florida and Georgia, but still the deposit cannot be classed as a marl. Another interesting feature of this stone is that no clay, silica or alumina bearing material has to be added for production of a high-grade portland cement. One end of the deposit has a high lime content (the following is a typical analysis of that stone):

SiO_2	10.5%
Al_2O_3	4.2%
Fe_2O_3	0.6%
CaO	46.0%
MgO	0.5%
SO_3	Trace
Ingition loss	36.0%
$CaCO_3$	82.0%

The stone at the other end of the quarry, known as the "low lime," has an analysis as follows:

SiO_2	17.5%
Al_2O_3	6.0%
Fe_2O_3	1.0%
CaO	40.5%
MgO	0.5%
SO_3	0.3%
Ignition loss	31.5%
$CaCO_3$	72.0%

Between these two extremes of high and low-lime materials are all gradations, so that the laboratory after making an analytical survey of the face is able to make an approximate blend at the very outset if desirable.

The stone is loaded into specially designed cars, each car being a standard-gage flat car of the conventional type, on which have been mounted three scoops or pans, each pan holding 10 cu. yd. The pans are pivoted at the open or discharge end so that by lifting the opposite end the contents can be side-discharged. The company owns 20 of these cars, which were built by the Koppel Car and Equipment Co. The stone cars are hauled to the crushing plant over nine miles of standard-gage track by a 70 ton steam locomotive which was purchased from the Union Pacific Railroad Co.

No switch engine is necessary at the quarry, as the track has been so laid out that the cars can be dropped by gravity past the loading shovel. Later a switch engine may become necessary. The railroad track between the quarry and plant is practically level all the way, as the area traversed is a typical Wyoming prairie.

The train usually consists of 10 cars and requires about 1½ hours to make the round

Face of shattered limestone exposed in a ravine near the quarry

trip, although the engine is capable of easily hauling 40 to 50 cars per trip should it ever become necessary.

Crushing Plant

The cars on arriving at the crusher are dumped to the 36-in. Traylor gyratory crusher by a high speed motor-driven hoist. A 25-ton Northern electric crane can be run over all the primary and secondary crushers as well as the bucket elevator for facilitating repairs to those units.

The loaded cars can be dropped by gravity to the crushing plant, as the tracks have been elevated and a grade established of 0.8 ft. per 100 ft. This is not quite sufficient for dropping the cars down under all conditions, so if necessary a 15-hp. vertical capstan car puller can be used to spot the cars at the crusher. When not otherwise engaged, the locomotive is also used for this purpose.

The gyratory crusher is in a pit 29 ft. deep, and incidentally this pit was blasted out of the solid rock that underlies the area, so that all foundation construction was a simple matter, outside of some water troubles encountered while sinking the crusher pit. This crusher is driven by a 200-hp. General Electric induction motor through a 24-in. leather belt. This motor operates on 2200 volts, as do all the motors in the plant that have a rated capacity in excess of 50 hp., and all motors under that rating operate on 440 volts. Further details as to the characteristics of this and other motors used throughout the plant may be found in the motor schedule that concludes this article.

The gyratory crusher is set to discharge a 4½-in. product which falls to the boot of a Chain Belt Co. inclined steel 48-in. bucket elevator. There are 73 buckets, all of the two-compartment type. The elevator has a vertical lift of 58 ft. and a horizontal movement of 34 ft., and has a capacity of 350 tons per hour, discharging through a small reinforced-concrete surge, or storage, bin above, by means of a reciprocating pan feeder, to a No. 12 "Thor" series, Pennsylvania Crusher Co. hammer mill. The feeder was supplied by the manufacturers of the hammer mill.

The bucket elevator is driven by a 60-hp. General Electric induction motor through a right-angle Cleveland speed reducer, size 700-R.T., ratio of reduction 9¾:1. Enclosed gears are used for further speed reduction. The reciprocating feeder is driven by a 10-hp. motor through a De Laval speed reducer, and the hammer mill is direct-connected to a 300-hp. General Electric induction motor.

The secondary crusher is set to discharge a ⅝-in. product, which falls to an inclined 30-in. "Sterns Rex" belt conveyor using a Pioneer Rubber Mills belt. The carrier rolls are of the three-roll troughing type and are placed at 4-ft. centers, while the return

A train of empty quarry cars starting to the deposit

Not an oil well—just the artesian well supplying plant water

rolls are the single, flat type and on 8-ft. centers. All rolls are equipped with Alemite nipples for lubrication.

The inclined belt discharges to a second 30-in. horizontally running belt conveyor of the same make, which runs at right angles to the first belt and delivers the product to outside storage.

The galleries in which these two belts operate are of steel and reinforced-concrete construction; the reinforced-concrete floor slabs of this portion of the mill as well as those used throughout the entire plant were precast on the job, and the corrugated cement-asbestos roofing that covers these galleries was supplied by the Eternite Co., St. Louis, Mo. Incidentally, the roofs of the other buildings are precast concrete slabs covered with a 3-ply, built-up, 20-yr. roofing made by the Western Elaterite Co., Denver, Colo.

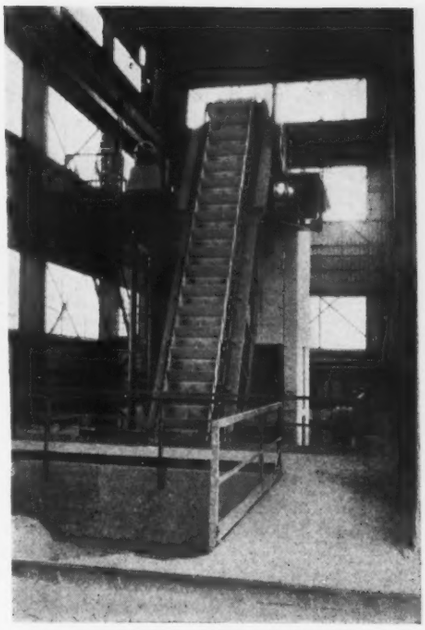
All machinery, stairs and walkways are protected by either woven wire metal screens or by the usual pipe rails. The walkway floors and stair treads are all steel and were supplied by the Irving Iron Works.

The inclined belt is driven by a 30-hp., 1165-r.p.m. General Electric motor through a size 800-AT, right-angle, Cleveland reduction unit, ratio of reduction 43:1. The horizontal belt is driven by a 20-hp. motor, 1170 r.p.m., through a size 700-AT, right-angle, Cleveland reducer (43:1). The former belt has a center-to-center length of 233 ft., a vertical lift of 49 ft. The angle of belt inclination is 12 deg. The horizontal belt has a length of 228 ft. center-to-center. Both belts operate at 250 ft. per min., approximately.

Raw Material Storage

The raw clinker, gypsum and coal storage building, which is of the retaining wall type, has an overall length of 242 ft., is 77 ft. wide and 30 ft. high, divided up into four sections or compartments. Starting at the end nearest the crushing plant is a section for crushed stone, 66 ft. long by 77 ft. wide, or the full width of the storage pocket except for the gypsum storage offset. This pocket has its outboard end open and will hold 139,000 cu. ft. of stone, or, at 100 lb. per cu. ft., 6950 tons or raw material for 22,000 bbl. of cement at 3.15 bbl. per ton. Next is the clinker storage compartment, which is 132 ft. long and the full width (77 ft.), with a capacity of 254,100 cu. ft. or 63,500 bbl. at 5 bbl. per ton. This storage capacity is equivalent to 31.75 days' operation.

In one corner of the clinker storage what might be called an offset pocket, 20x30 ft., has been provided for gypsite storage. This pocket holds 18,000 cu. ft., or 750 tons, of gypsite, enough for 48 days' operation. The end pocket is for coal and has a length of 44 ft., with the 77 ft. width, holding 97,400 cu. ft., or, at 50 lb. per cu. ft., 2435 tons. This storage capacity will, at 100 lb. of coal per bbl., be sufficient for 48,700 bbl. of cement, or 24.4 days' production.



Plant elevator carrying limestone from the primary gyratory crusher to the secondary crusher or hammer mill

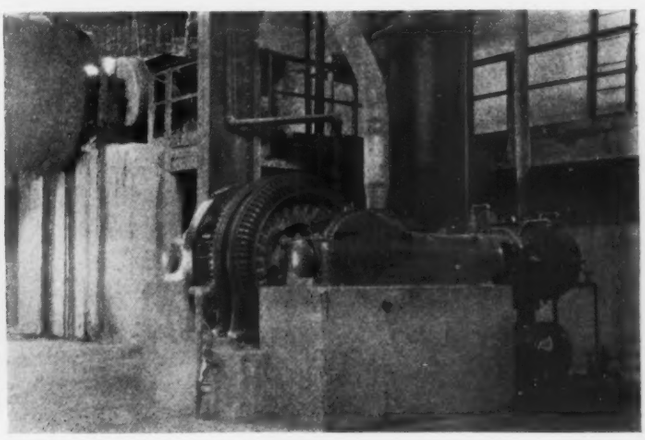
The crushed cement rock, clinker, gypsum and coal are all delivered to small bins ahead of the various grinding units by a Pauling and Harnischfeger, 10-ton, overhead, electric crane that spans the width of the storage building. A 3-yd. Hayward clamshell bucket is used. The building is open at the ends and sides, but is well protected above by a concrete-slab sectional roof.

Raw Grinding

The cement rock is delivered to a steel hopper holding 650 bbl. of stone by the electric crane. This hopper outlets to an F. L. Smidth and Co. circular or disc feeder that serves the single, No. 20-39, three-compartment, "Unidan" mill. The disc feeder is working very satisfactorily with a half-sticky material.

Samples are taken at regular intervals at

The secondary crusher—a large hammer mill direct connected to a 300-hp. electric motor

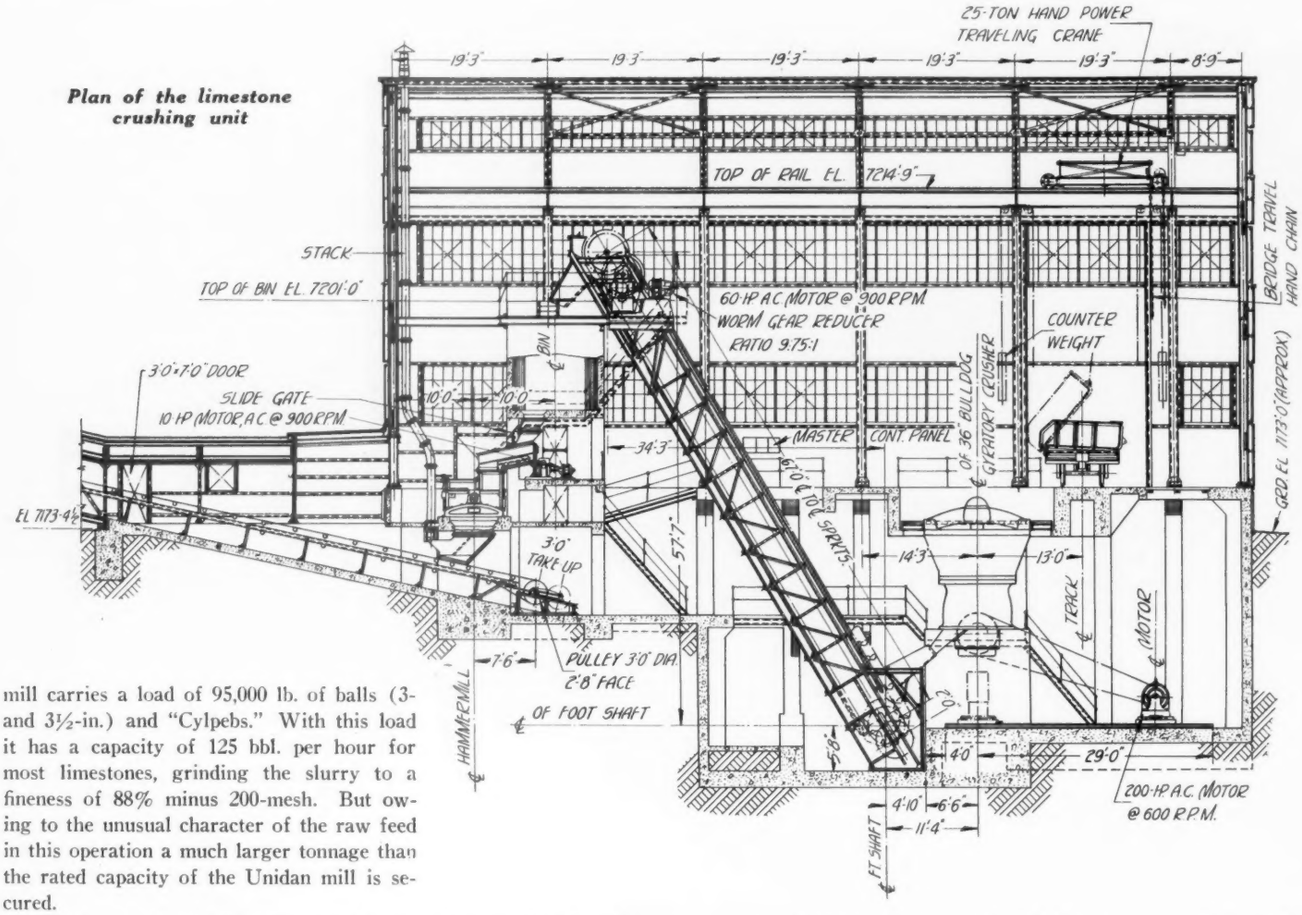


One of the small air compressors placed close to point of air consumption

the feed and discharge of this mill, which is the second step in the process control.

Water is added at the feed end of the Unidan mill and the operator endeavors to maintain a water content of 40%, but at times a 42.5% water content is carried to facilitate later pumping operations. The kiln, has resulted in noteworthy fuel economies. Daily fuel consumption has been as low as 95 lb. of coal per bbl. of clinker, making a cement of the excellent qualities already enumerated.

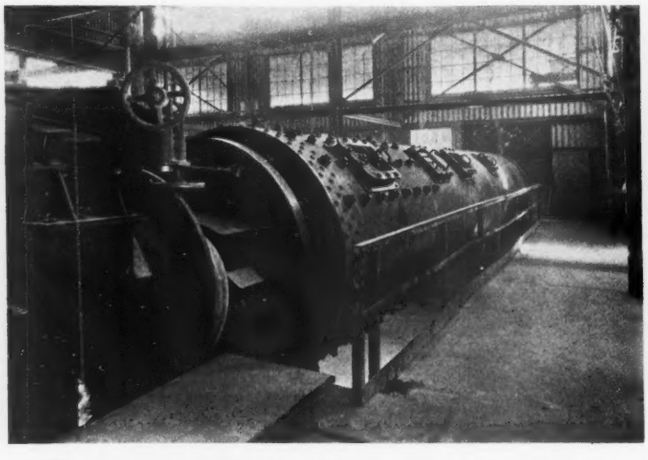
Another one of the outstanding features of this plant is the use of the "Tronyon-



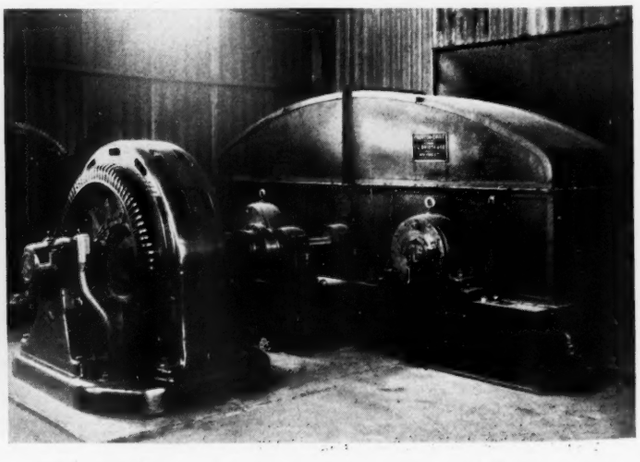
Plan of the limestone crushing unit

mill carries a load of 95,000 lb. of balls (3- and 3½-in.) and "Cylpebs." With this load it has a capacity of 125 bbl. per hour for most limestones, grinding the slurry to a fineness of 88% minus 200-mesh. But owing to the unusual character of the raw feed in this operation a much larger tonnage than the rated capacity of the Unidan mill is secured.

The slurry is fed to the kiln at a fineness of 93% minus 200-mesh. This finely ground kiln feed has resulted in kiln operation being conducted at 100 to 150 deg. F. below the temperature ordinarily required. This case of calcining, coupled with the unusually long Symetro" drive between the synchronous motor and the mill. This drive is a special design of the F. L. Smidth and Co. engineers and combines the high efficiency of precision gearing with that of higher speed motors. The "Symetro" drive runs smoothly and quietly, and Mr. Anderson, superintendent of the plant, stated that considerable power was saved by its use. The synchronous motor driving the unit has a rated capacity of 600 hp. or approximately 450 kw., but the normal load is considerably below this. The oil delivery system is tied into an interlocking system so that in the event of non-flow of oil the mill motor kicks out. Again a maximum and minimum thermometer control requiring not less than 65 deg. F. oil temperature and not over 150 deg. F. is tied into this interlocking



Three-compartment tube mill for raw grinding carries 95,000-lb. load of grinding media



The 600-hp. synchronous motor and special drive connect it to the tube mill

system and deviations from these temperatures cause the mill to stop.

A fifth function of the safety interlocking system is a device that stops the mill in the event settlement of either the heavy drive unit or the mill, throwing the bearings out of alignment. A sixth function is, if the offbearing slurry pump stops or fails, the grinding unit stops automatically.

Whenever the mill stops, an annunciator on the separate switchboad drops a numbered shutter, thus indicating to the operator precisely what the trouble is. The device is referred to as a safety interlocking system and it enables the power-house attendant to do his regular duties as well as to look after the motors and drives, as these units are in the power house proper with the slow-speed shaft connecting the mills passing through the intervening wall. The "Symetro"-drive, slow-speed shaft is connected to the Unidan mill through a special F. L. Smidth and Co. chrome-nickel torsion shaft and flexible membranes.

A Fast, flexible coupling, made by the Bartlett-Hayward Co., couples the motor with the "Symetro" drive.

The raw Unidan is driven by a 600-hp. synchonrous motor, a product of the Electric Machinery Manufacturing Co., Minneapolis. The motor operates at 720 r.p.m.

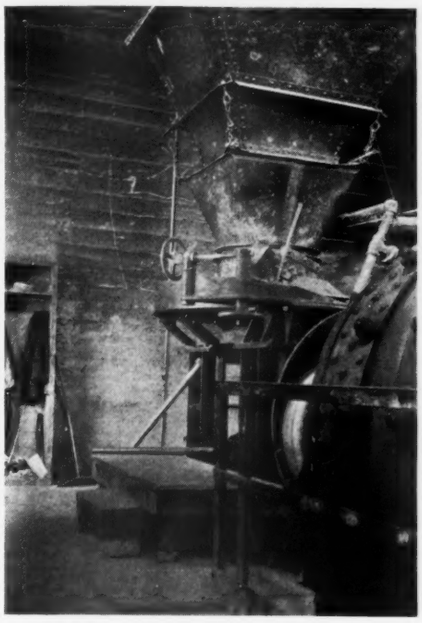
A Northern, "Hi-Lift," 2½-ton capacity electric hoist spans the room over the two Unidan mills, air compressor and Fuller-Kinyon pumps.

The slurry from the mill passes through a concrete launder to a small reinforced-concrete tank, that acts as a feeder to the two 4-in. Wilfley centrifugal pumps. The tank and pumps are located in the basement under the three correction tanks. The two pumps are each direct connected to 25-hp., 1165-r.p.m., General Electric induction motors and deliver the slurry to an 8-in. header that serves the correction tanks. The flow of slurry through the suction lines, discharge lines, at the pump and at the discharge line where it enters the three tanks, is controlled by Nordstrom lubricated valves.

Correction Tanks

There are three reinforced-concrete correction tanks, 20 ft. in diameter and 18 ft. deep, each holding an equivalent of 593 bbl. of cement. This capacity allows a deduction of 1 ft. from the height for operating conditions. The operation of filing these tanks is conducted so that there will be a variation in the analysis of each tank, yet by drawing predetermined volumes from two or more tanks a blended slurry will go to the single mixing tank. To insure an exact proportioning the correcting tanks are sampled at regular intervals while filling and again when full, and a complete chemical analysis made from these samples.

The correction tanks are equipped with



Feed end of the raw grinding mill

F. L. Smidth and Co. mechanical agitators that are so designed that air is injected into the slurry through the arms of the rabble mechanism. Each tank has one vertical agitator shaft and all three are driven from a single 25-hp., 1165-r.p.m., General Electric induction motor through a Pacific Gear and Tool Works (San Francisco, Calif.) speed reducer with a ratio of reduction of 29:1, with further speed reduction by means of pinion and bull gears.

The mixing tank is oval-shaped in plan, having a length of 51 ft. 6 in., 21 ft. deep and 20 ft. in width. The basin holds material for 1993 bbl. of cement. Similarly, this tank is equipped with four Smidth agitators, all driven from a single shaft by a 25-hp., 1165-r.p.m., General Electric induction motor through a Pacific Gear and Tool Works reduction unit.

The mixing tank, after its contents have been checked by the laboratory, discharges through a syphon-like channel in such a manner that the slurry in the mixing tank is taken from the bottom of that tank up through the discharge port, overflowing into the rectangular storage basin. This patented arrangement tends to prevent segregation of the heavier particles in the slurry, which would be the case if the mixing tank simply overflowed into the storage basin.

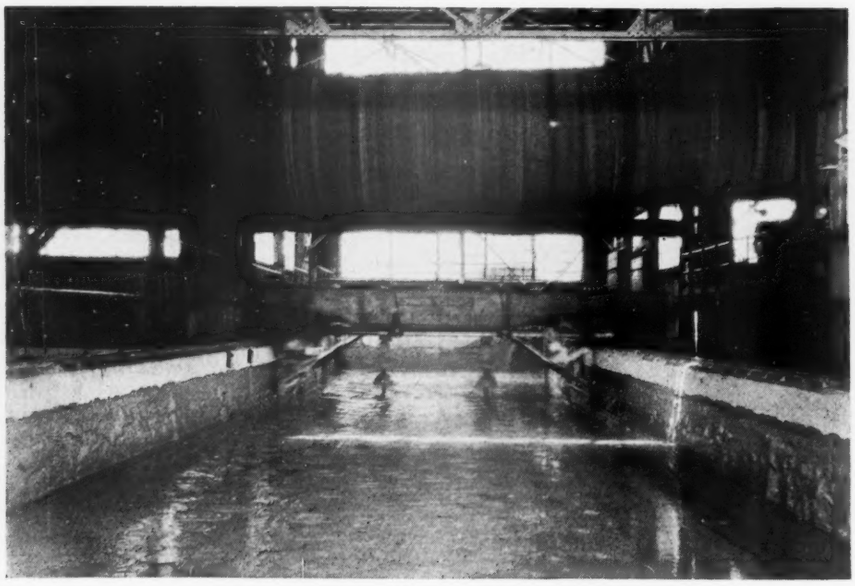
The storage basin is 125 ft. long, 25 ft. wide and 21 ft. deep, having a capacity of 6250 bbl. of cement, or a sufficient quantity to run the plant 3.1 days. This calculation is based on the tank being full, but for working conditions a 10% deduction is usually allowed, giving the basin a capacity of 5625 bbl., or 2.8 days' supply.

The basin is in the same building with the correction and mixing tanks and rotary kiln, but is so placed that it is under and at right angles to the axis of the kiln. The tank is placed at a sufficiently low level that the Smidth traveling agitator clears the kiln shell. The stirring mechanism of this agitator is driven by a 10-hp., 575-r.p.m., General Electric motor through a Foote gear reduction unit, and the travel mechanism by a 5-hp., 575-r.p.m., General electric motor through a Cleveland reduction unit.

Air Compressors Distributed

Another rather unusual detail of this plant, and one which modern engineering is beginning to recognize and appreciate, is the use of several air compressors located close to the point of air consumption, in place of one large unit centrally located. Not only is the air delivery more efficient on account of the short pipe lines necessary, but in the event of part of the plant being down it is not necessary to use all the compressor capacity, which would be the case with a single large unit. At this plant the air for agitation is secured from an Ingersoll-Rand "Imperial" Type IR, two-cylinder, 16x12-in., 277-r.p.m., compressor delivering air at 45-lb. pressure to a 5x16-ft. vertical receiver that rests on top of the mixing tank. The compres-

Part of the raw cement materials storage



Slurry basin under the kiln and its traveling agitator

sor is located in a room below the correction tanks. Compressor lubrication is effected by a McCord forced feed, visible type lubricator, driven from the crankshaft by a small belt. The compressor is driven by an Electric Machinery Manufacturing Co. 140-hp. synchronous motor, direct-connected to the crankshaft.

All of the compressors are equipped with "Midwest" air filters through extended pipes that reach to points of minimum dust.

Another detail of the air-compressor installation, that might be mentioned in passing, is that where skilled engineers are employed to design and install air compressor units they invariably mount the receiver in the vertical position. By so mounting less floor space is required and, what is far more important, the excess oils and waste that accumulate in an air receiver can be drained out far more thoroughly, reducing to a minimum likelihood of air receiver explosions. All industrial operators could do well to follow this practice.

Slurry Pumps

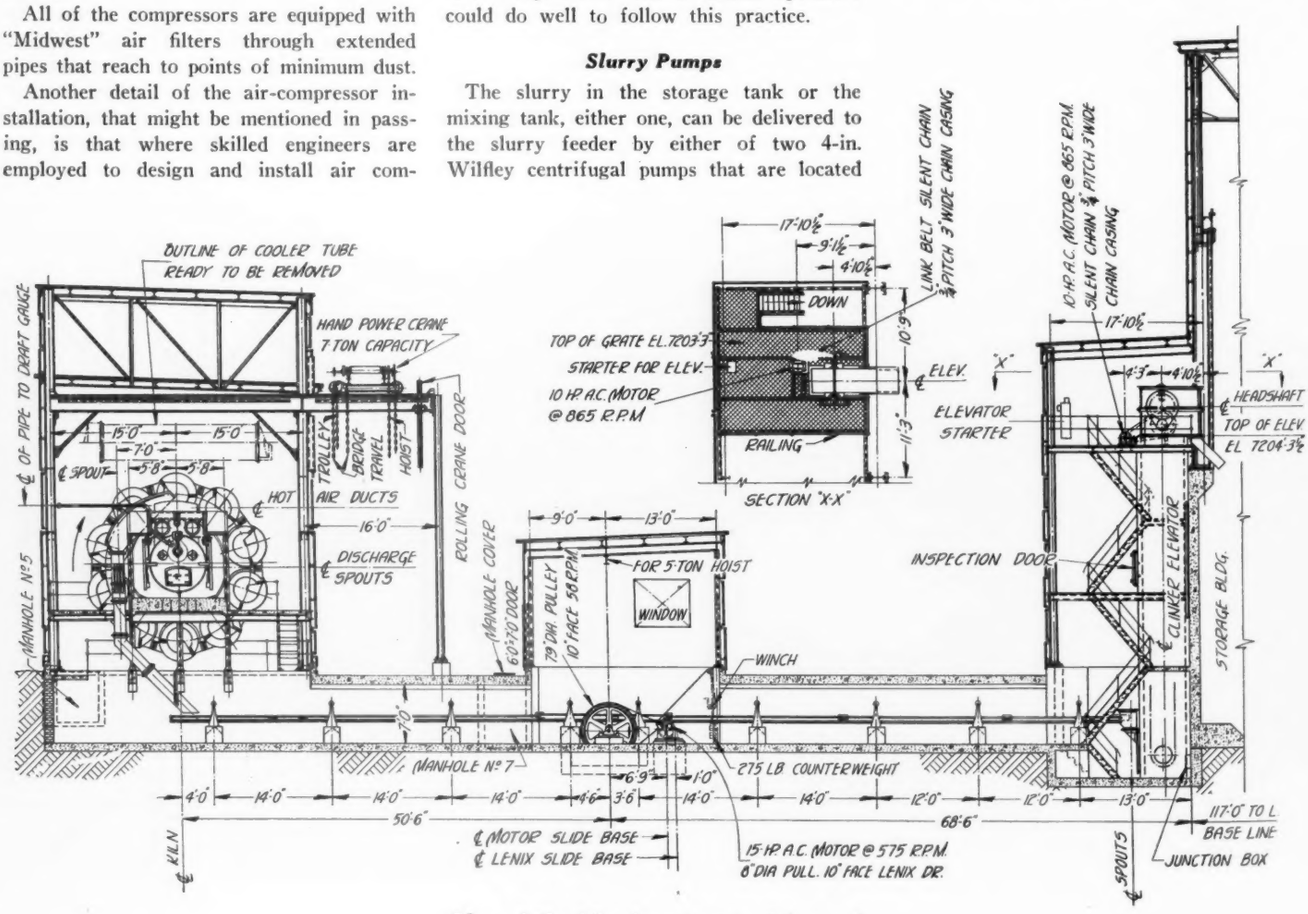
The slurry in the storage tank or the mixing tank, either one, can be delivered to the slurry feeder by either of two 4-in. Wilfley centrifugal pumps that are located in a pit alongside those two tanks, so that there is a drop of several feet from the two storage basins to the pumps' intake. The headers from the two tanks are 10-in. pipe and the line to each pump is 6-in., and the header, intermediate intake line and the 4-in. discharge lines are equipped with Nordstrom lubricated plug valves. Each pump is direct-connected to a 30-hp. motor.

The discharge line from these pumps is so arranged that a certain amount of slurry can be sent to the slurry feeder and the excess by-passed to the rectangular storage basin, eliminating an output of energy that would be necessary if the entire flow were lifted to the higher slurry feeder and the excess from there allowed to return to its source. This is one of the many little details that make for a low operating cost.

Kiln Slurry Feeder

The slurry feeder consists of a rectangular steel box divided into three compartments by two low partitions. The flow of slurry comes up through the bottom of the middle partition and flows over the lower partition, allowing the excess slurry to return to the storage basin. This feature is merely to insure a constant level in the middle partition.

Passing through this rectangular box is a horizontal shaft to which is keyed an S-shaped hollow scoop, which when rotated



Plan of the kiln department—firing end

by a suitable motor, scoops out a constant amount of slurry. As the "S" member is hollow, the slurry flows down through the arms and out through the enlarged hollow shaft, discharging the measured slurry into the third compartment, where it flows to a measuring pocket or to the kiln via a device that is used to mix any dust returned to the system with the slurry before passing to the kiln. The measuring pocket is merely the well-known cylindrical tank having a known volume, and by the use of a stop watch the time required to fill this pocket indicates the flow per minute of slurry.

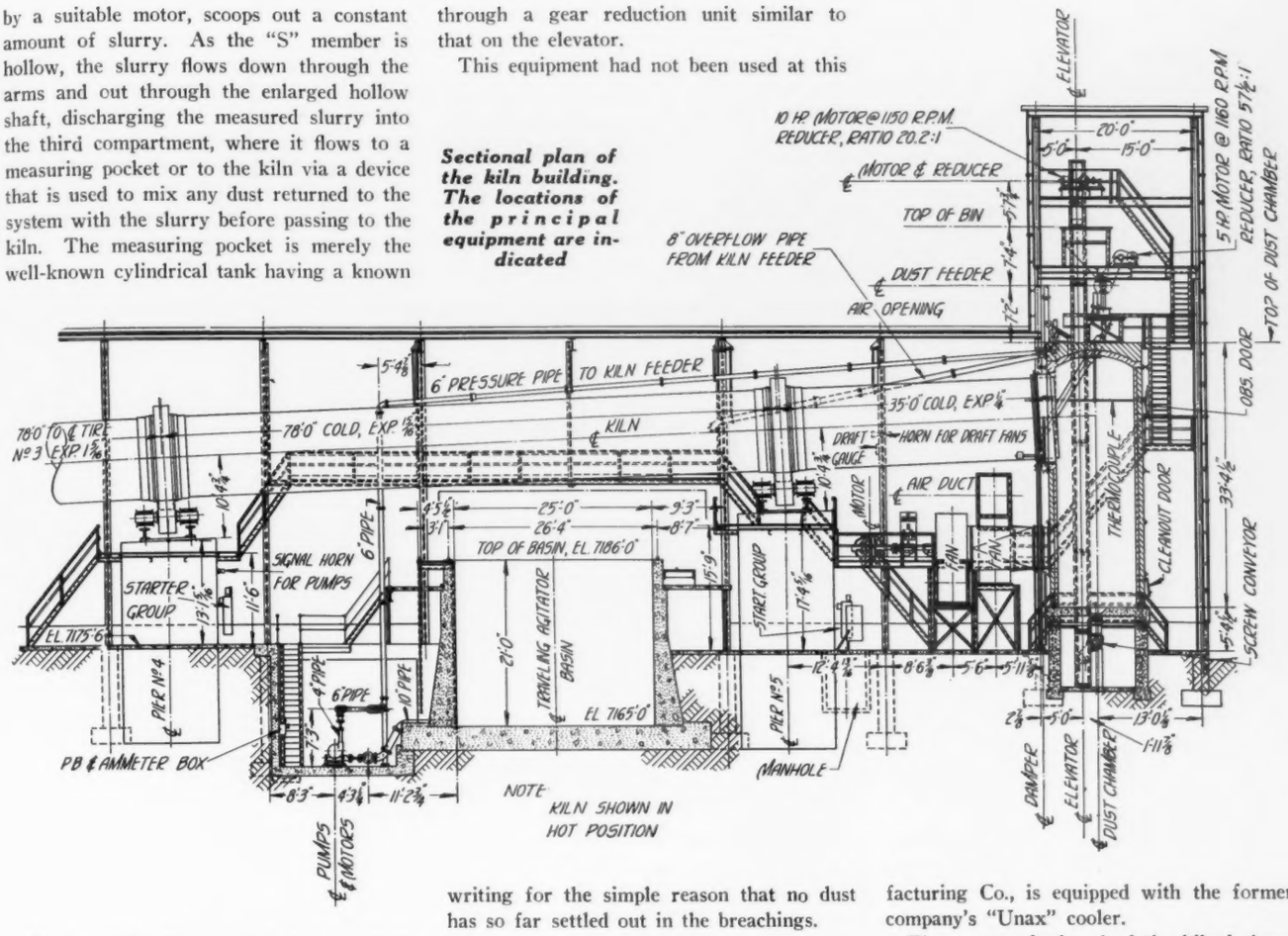
The device for mixing dust is a spiral race with the slurry flowing tangentially into the small receptacle, giving the slurry a swirling action so as to incorporate the incoming dust with it.

The horizontal shaft supporting the scoop is driven by a variable speed electric motor, the speed of which is synchronized with that of the kiln, so that any stoppage or decrease in kiln rotation will cause a corresponding reduction in the flow of slurry.

The feeder is driven by a 5-hp., 1200-r.p.m., Type F.R.M., Ideal Electric and Manufacturing Co., direct-current, variable-speed motor through a Stephens-Adamson variable speed transmission, Type R, Frame 5010, 120 to 720 r.p.m., with input speed of 1200 r.p.m. This in turn serves a right-angled Cleveland reduction unit, size 300-AT, whose slow-speed shaft is the shaft on which the "S" scoop is mounted.

Any dust that accumulates in the breaching at the end of the kiln is returned to the kiln feed by means of a small bucket elevator that delivers the dust to a short screw conveyor just ahead of the slurry-dust mixing device. The elevator is driven by a 10-hp. motor through a Pacific gear reduction unit and enclosed chain drive. The screw conveyor is driven by a 5-hp. motor through a gear reduction unit similar to that on the elevator.

This equipment had not been used at this writing for the simple reason that no dust has so far settled out in the breachings.

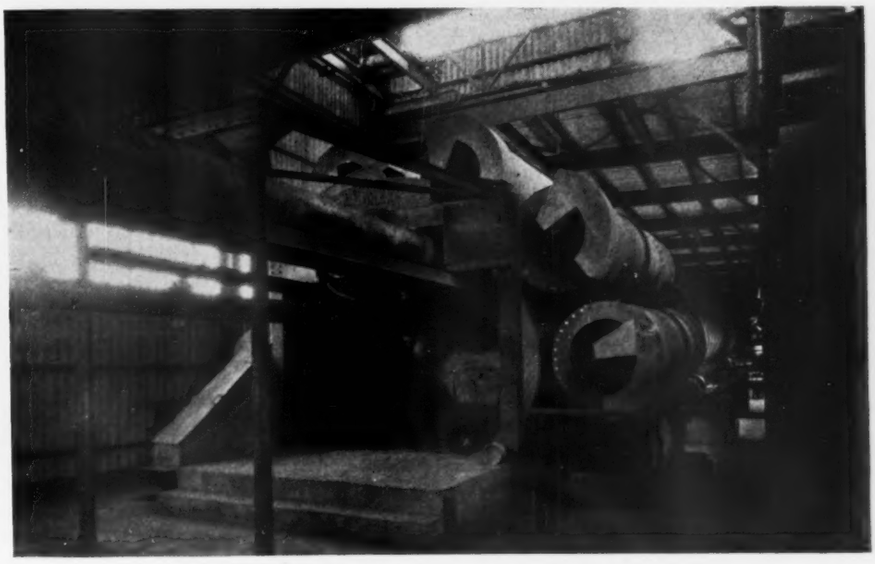


Sectional plan of the kiln building. The locations of the principal equipment are indicated

The Kiln

The plant at present has one kiln of unusual length, 343 ft., and it is 11 ft. 3 in. and 10 ft. in diameter. The larger diameter section is 119 ft. long and the smaller 213 ft., with 9 ft. for the coned section. The kiln, designed by F. L. Smidth and Co. and built by the Traylor Engineering and Manufacturing Co., is equipped with the former company's "Unax" cooler.

The raw or feed end of the kiln is hung with ⅝-in. chains for 71 ft. of its length. This patented feature of a Smidth kiln acts as a method of heat transfer between the slurry and the hot gases; the chains becoming heated from the exit gases pass this heat to the slurry, resulting in a much higher fuel efficiency than if the gases simply passed over the slurry. At the same time



Firing end and cooling section of the single long kiln

The dome at the left covers the concrete water supply tanks; the pumps are in the house

the chains act to disintegrate any lumps that might form. The fire brick lining of the kiln is of the General Refractories Co.'s "Arcofrax" high alumina brick, with "Moler" brick, an F. L. Smidth and Co. product in the calcining zone.

The kiln has an inclination of ½-in. per lineal ft., and rotation can be ranged from 172 sec. per revolution to 58 sec. per revolution.

Over the kiln at convenient points are suspended Yale and Towne chain blocks for repair purposes.

The cooler consists of 10 tubular members, 22 ft. long and 42 in. in diameter, located concentrically around the discharge end of the kiln and rotating with the kiln. The coolers are supplied with ⅜-in. chains which function to first take up the heat from the hot clinker and pass this heat to the incoming air entering the kiln. For 41 ft. in each end of the cooler cylinder a lining of fire brick is used, with the throat between kiln and cooler made of heat-resisting steel, a special alloy of F. L. Smidth and Co. specifically made to withstand the abrasion and intense heat of the effluent clinker.

The kiln has five sets of supporting rolls and a thrust roll, using two rolls at each bearing point. The drive motor is located at the third bearing from the hot end, as is also the thrust bearing.

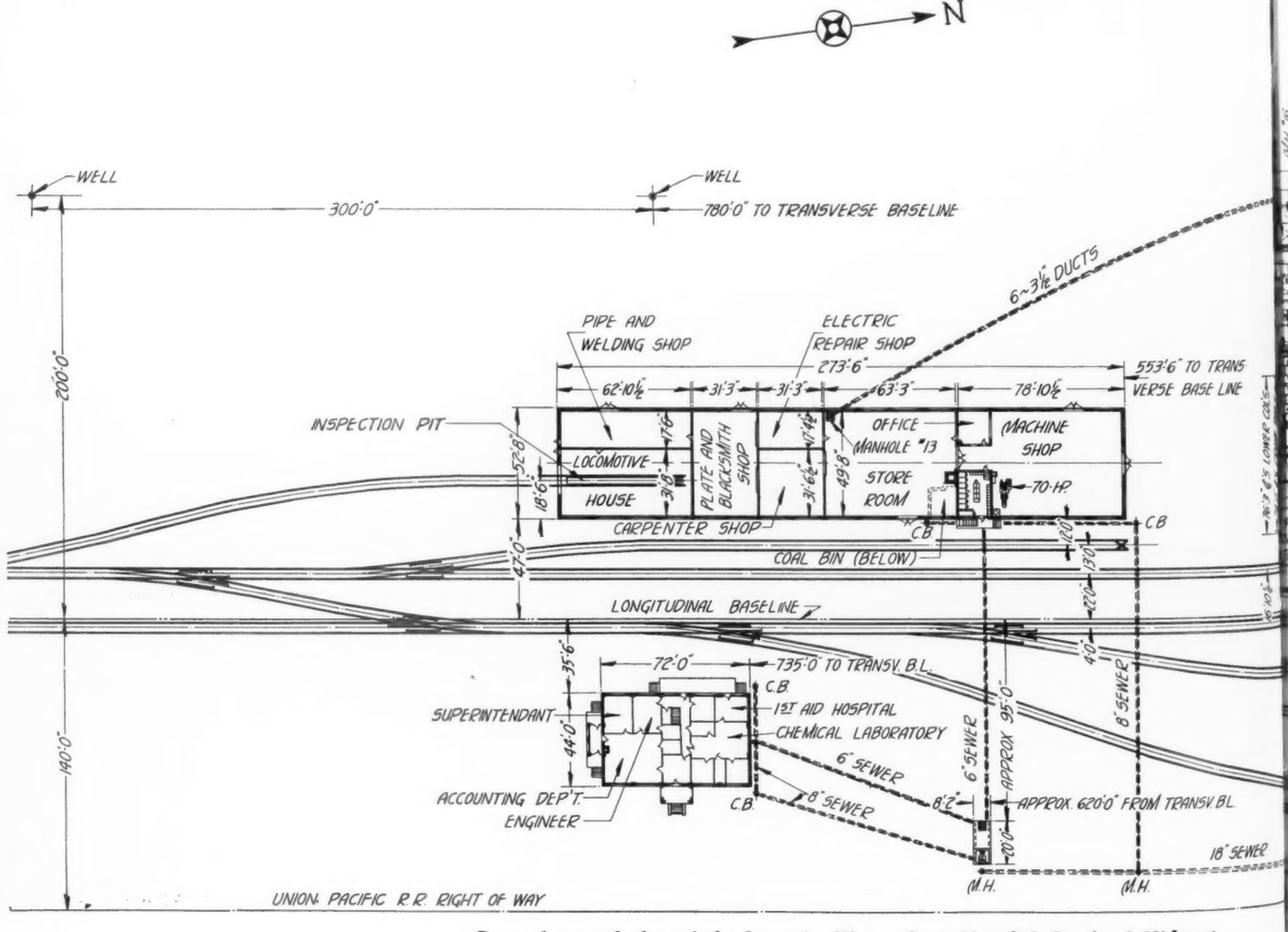
The kiln is driven by a General Electric direct-current motor, 50- to 100-hp., 230 volts and 400 to 1200 r.p.m., through a Pacific Gear and Tool Co. speed reducer and two sets in series of enclosed gear reductions. The slow speed shaft of the final gear reduction pinions the steel ring gear.

Kiln Control

In addition to the draft induced by two F. L. Smidth fans, a 150-ft. stack has been provided. The stack was designed and constructed by the Macdonald Engineering Co., Chicago, Ill.

The fans are each direct-connected by an extended shaft to a 40- to 50-hp. General Electric variable speed, direct-current motor that is synchronized with the motors driving the kiln and the slurry feeder. The motors are rated 150 to 184 amps., with a speed range of 450 to 560 r.p.m. The bearings on the fans are water-cooled.

At the fire end of the kiln is mounted a



General ground plan of the Laramie, Wyo., plant, Monolith Portland Midwest

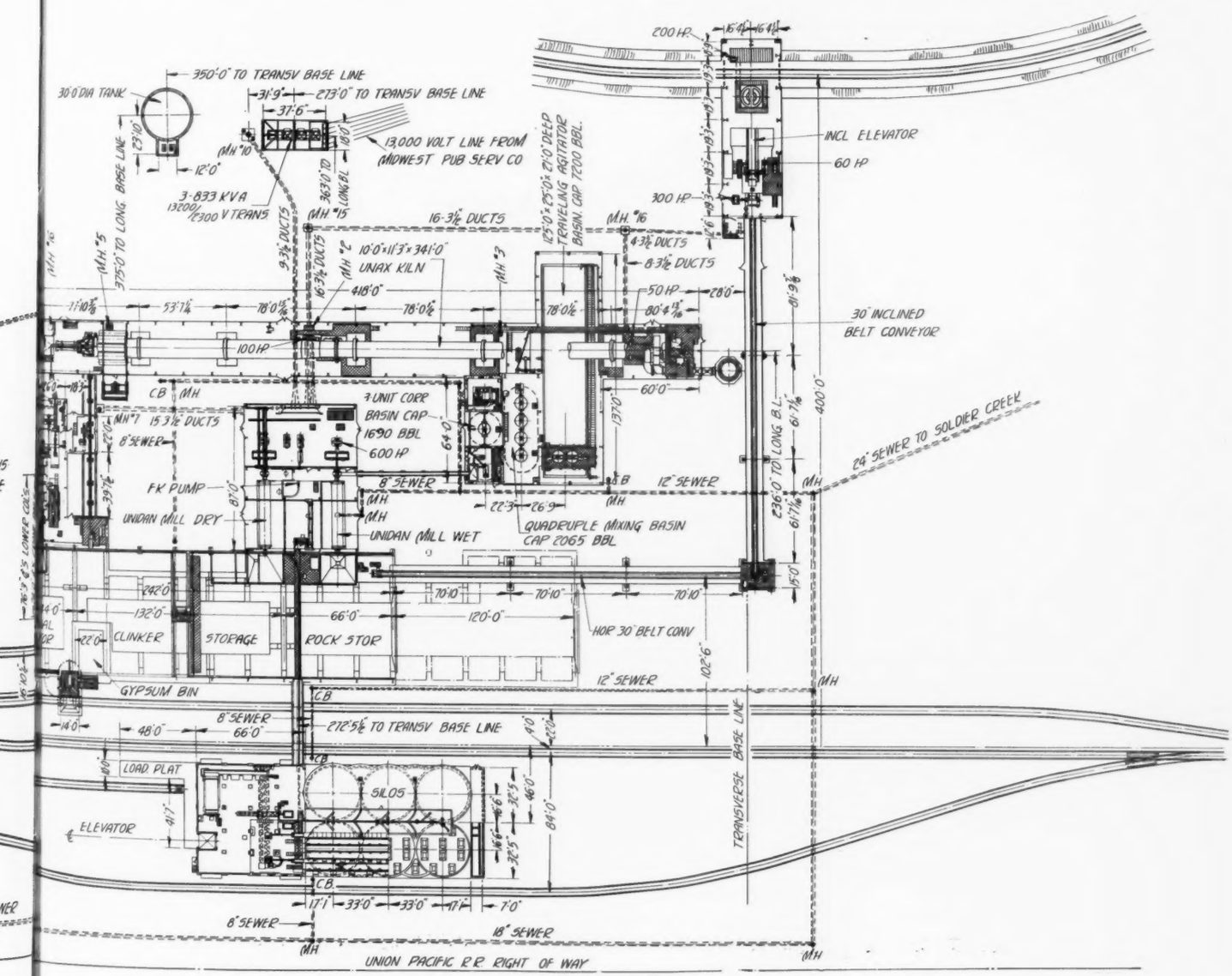
panel designed by F. L. Smidth and Co., on which is mounted a Leeds and Northrup "Potentiometer" that indicates the temperature of the gases as they emerge from the kiln, the hot point of the couple being placed just above the point where the slurry enters the kiln. The temperatures for normal operation range from 475 to 525 deg. F. Actual kiln temperatures are said to be from 2300 to 2400 deg. F., which are 100 to 200 deg. F. lower than most portland cement kiln temperatures. Separate wire leads on this couple extend to the laboratory and connect with a recording "Potentiometer." Also, here are mounted lights which indicate whether or not the "Skipulter" that carries the clinker is operating properly and also whether the elevator receiving the clinker from the "Skipulter" is functioning properly. Counters for recording the r.p.m. of the kiln and the slurry feeder, as well as Ellison draft gages, are also mounted here. Later a device will be installed to indicate to the burner whether or not the slurry feed pumps are operating, also indicating any stoppage in the discharge line.

This master kiln control panel is about 8 ft. long and has on its back a steel box running the full length of the panel. In this steel box are located about 100 terminal blocks each numbered to correspond with the wiring diagram and about 100 control wires terminating at this control board. On the back are also located the various field regulators for the adjustment of the speed of the d.c. motors. On the front of the panel are located the push buttons for the control of all the motors, ammeters, speed indicators, revolution counters, interlock relays, signal lamps indicating the proper working of preceding and succeeding motors, draft gauges, indicating pyrometer, and of course, the hand wheels for the above mentioned field regulators.

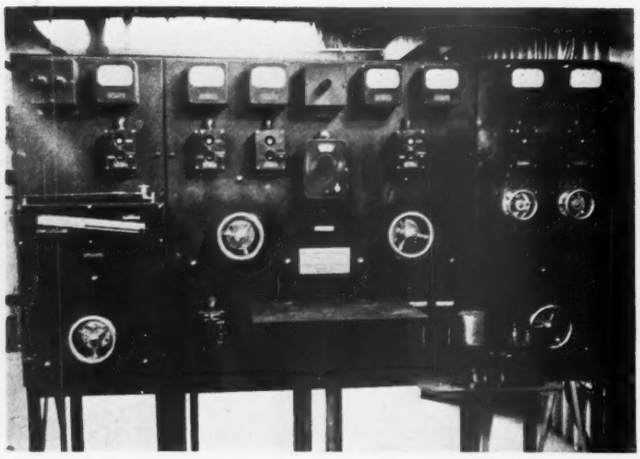
At the feed end of the kiln is located an auxiliary panel containing the instruments of two bulb thermometers. These instruments are equipped with electrical contacts which by means of relays, will sound an alarm in case the gases, when passing the induced draft fans, should reach a dangerous temperature, and will cause the operator to open a cold air intake provided on the smoke chamber. On the same panel is also located a test draft gage with a manifold with test cocks so as to permit the checking of the draft at various points of the system. This is also used for checking the indication of a draft indicator brilliantly illuminated so it can be clearly observed from the burner's platform by means of a telescope. This draft gage indicates the draft at the mouth of the kiln.

Fuel

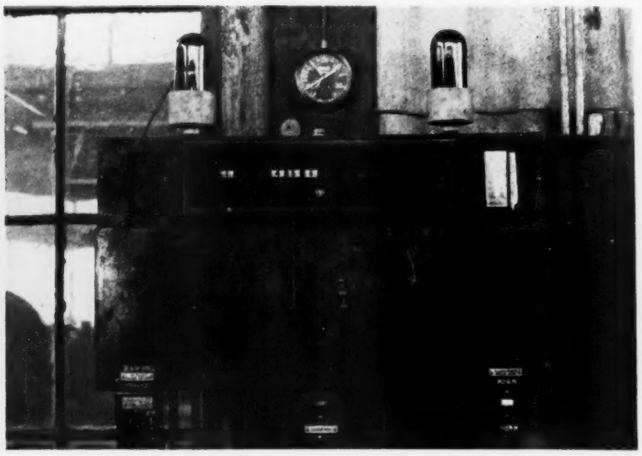
Coal pulverized to 90% through a 200-mesh screen is used for fuel, and is delivered to a steel hopper from the "Pyrator" dryer by a 6-in. Fuller-Kinyon pump. Directly below the steel hopper is mounted an F. L. Smidth and Co. "Duplex" screw-type coal feeder that delivers to the discharge of a Buffalo Forge Co. No. 55 fan.



Co. showing the locations of the principal mill buildings and equipment



Switchboard at the kiln for the control of mechanical features and heat for the burning operation



Switchboard used in interlocking system of control. The numbers indicate trouble at locations designated

The use of the "Duplex" screws, which, incidentally, rotate in opposite directions and are of small pitch flight, insures a steady flow of pulverized coal with a minimum of pulsation, providing a steady and uniform flame. The fan is driven by a General Electric, variable-speed, direct-current motor, 1750/2200 r.p.m., rated at 40 hp. The coal feeder is also driven by a variable speed, direct-current motor, 450/1800 r.p.m., through a Pacific gear reduction unit (15:1).

The clinker falls to an F. L. Smidth and Co. "Skipulter" having a length of 115 ft. and reciprocating 59 times per minute. A description of this type conveyor, which has become so generally used in the industry, is unnecessary. The conveyor is driven by a 15-hp. General Electric induction motor, 550 r.p.m., through an 8-in. belt using a "Lenix" short-center drive. The Skipulter discharges to a bucket elevator that delivers the clinker to outside storage. This elevator is driven by a 10-hp. General Electric motor through a Link-Belt, silent-chain drive.

The "P and H" traveling crane over the stockpile delivers the cooled clinker to a steel hopper serving the No. 20-39 Unidan three-compartment mill. The clinker is fed to the mill by a reciprocating feeder that is direct-connected to the mill proper, and the gypsite is added at this point through an F. L. Smidth and Co. feeder. This feeder is merely a screw conveyor of small pitch diameter connected to a direct-current, variable-speed motor, through a right-angle Cleveland gear reduction unit.

It is interesting to note that this plant is perhaps the only portland cement plant in the United States that is using gypsite as a retarder. The gypsite is secured from the deposits owned by the United States Gypsum Co. a few miles from the plant, and has a calcium sulphate content of 85%. The laboratory has found this type of retarder to be very satisfactory.

In the vicinity of Laramie are thousands of acres of gypsite material. Gypsite is a gypsum earth resulting from the evaporation of calcium sulphate bearing waters, the successive layers of crystalline, flaky, purer gypsum salt being interspersed with foreign materials carried in by winds, etc., giving a material of indefinite gypsum content, usually low.

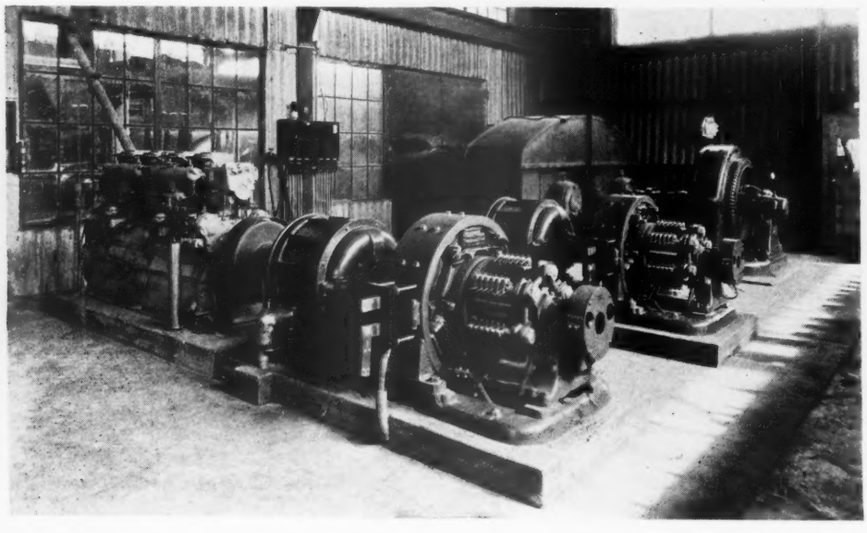
At the feed end of this mill the various organic compounds are added that go to make the Monolith waterproof cement, manufactured under the Olsen patents, the sole owner of which is the Monolith Portland Cement Co.

In the three-compartment Unidan mill used for grinding the finished cement there is a charge of 95,000 lb. of 3½-in. to 1¼-in. balls and "Cylpebs." The mill has a capacity of 120 bbl. per hour, at a fineness of 88% through 200-mesh screen. This mill is in the same building with the raw Unidan mill and is parallel to it, with the drive motor in the separate building housing the main plant control switchboard. This mill is driven by a 600-hp. Electric Machinery Manufacturing Co. synchronous motor through a "Tronyon-Symetro" drive of the same type used on the raw mill. The actual kilowatt consumption of this motor is from 430 to 450 kw.

This mill is likewise connected with the interlocking system on a separate panel and has all the advantages enumerated in connection with the use of that system on the raw mill; and, in addition, failure of the screw conveyor serving the Fuller-Kinyon pump or the pump itself, automatically kicks out the circuit breaker controlling the mill.

The finished cement from the Unidan mill falls to a short 16-in. screw conveyor that delivers to a 6-in. Fuller-Kinyon pump. This pump delivers to the storage silos through a vertical lift of 90 ft. and a horizontal movement of 300 ft. The pump is placed between and below the two grinding units and is direct-connected to a 60-hp. General Electric induction motor. The screw conveyor is driven by a 10-hp. motor through a right-angle Cleveland reduction unit.

The air used in connection with the Fuller-Kinyon pump is supplied by an Ingersoll-



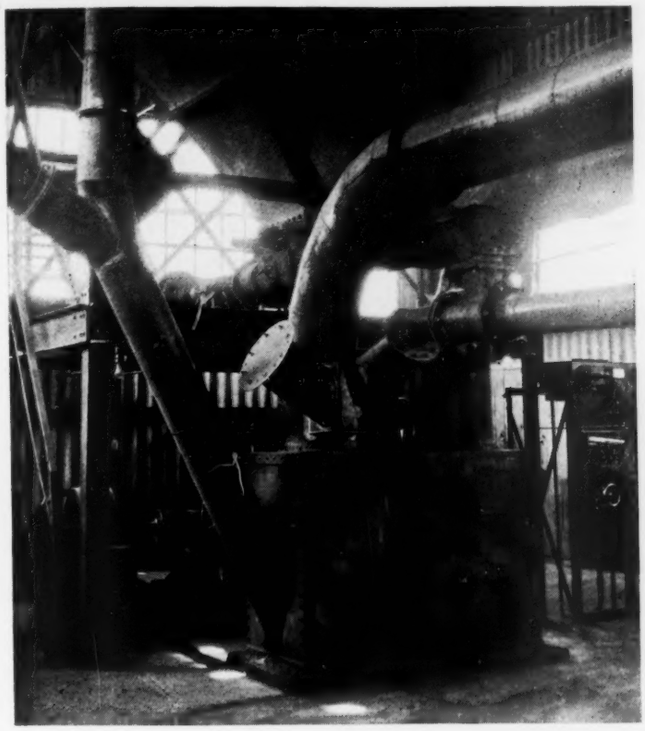
Auxiliary gas engine, direct connected to a d.c. generator. In the background is shown the gear reduction drive of the clinker grinding mill

Rand "Imperial," Type 10, XRE, 9¼-x16-x 12-in. compressor that is direct-connected to a 115-hp. synchronous motor. Air at 100-lb. pressure is delivered through a 4-in. line to a 48-in. by 12 ft. vertical receiver mounted alongside the compressor. Here again can be seen the advantages of a relatively small compressor unit located close to the point of use in contrast to a large centrally located unit.

Coal Supply

Coal is delivered to the plant in standard railroad equipment and discharged to a track hopper under which is mounted a Mead-Morrison coal crusher of the duplex roll type, driven by a 40-hp. General Electric induction motor. The discharge from this crusher falls to the boot of a bucket elevator that discharges to outside storage. The track hopper and elevator also are used to deliver the gypsite to outside storage, the two materials being directed to their proper pockets by swiveled spout. The elevator is so designed and located that coal may be reclaimed and re-elevatored from the storage pile and delivered back to its source. The object of this arrangement is to load coal for delivery to the quarry or for fueling the locomotive. The elevator is driven by a 25-hp. motor through a Link-Belt, silent-chain drive.

From the storage pile coal is delivered to a small pocket by the overhead crane, the pocket feeding a 20-in.x6 ft. Schaffer "Poidometer" that weighs the coal automatically as it is delivered to the "Pyrator" dryer. The Pyrator is one of the products of F. L. Smidth and Co. and is a coal dryer primarily, consisting of a unit mill surrounded with a suitable jacket through which hot air circulates. Most of the drying is secured by heating steel balls in a separate furnace and passing these balls through the mill. The balls not only give up their heat to the coal for drying purposes but also pulverize the coal at the same time. The dried pulverized coal passes to a short screw conveyor and is passed to a 6-in. Fuller-Kinyon pump, which pumps the pulverized coal to the steel hopper, in the kiln room.



Pulverized coal is delivered from the grinding unit to overhead bins which supply the burners

The Pyrator has two grinding compartments, and carries a charge of 2½-in. and 1½-in. steel balls and "Cylpebs."

The Schaffer Poidometer is driven by a 3-hp. motor through a Fawcus Machine Co.'s gear reduction unit and open chains. The short screw conveyor feeding the coal to the Pyrator is driven by a 5-hp. motor through a Pacific gear reduction unit, and the reciprocating ball feeder is driven by a 2-hp., direct-current motor through a Cleveland reduction unit. The steel balls discharged from the mill fall to a ball elevator and are elevated to a point above the furnace, where the balls return to the heating furnace. This elevator is driven by a 5-hp. motor through a suitable gear reduction unit. The fan for circulating air around the outer jacket of the Pyrator is a Buffalo No. 4 and is driven by a 5-hp. induction motor. The mill proper is driven by a 250-hp. synchronous motor operating at 164 r.p.m. and is connected with the mill by an extended shaft. The screw conveyor delivering to the pump is driven by a 5-hp. motor through a Cleveland gear reduction unit, and the Fuller-Kinyon pump is driven by a 15-hp., 875-r.p.m., General Electric induction motor.

Storage Silos

There are six reinforced-concrete circular silos with two star interstices and four outside pockets. The silos are 80 ft. high and 32 ft. in diameter. Allowing a deduction of 10 ft. in their height for operating conditions, the silos have the following capacities:

	Barrel each	Barrel total
Six silos	15,474	92,862
Four pockets	1,412	5,650
Two interstices	3,850	7,700
Total capacity		106,212

This storage capacity will be used for both the ordinary portland cement and the waterproof variety, the silos of course being used for only one material at a time. A system of unloading and delivering of cement using duplicate sets of conveyors has been installed so there is no possibility of the two becoming mixed.

Under the silos and parallel to the length of the silo structure are four tunnels in which there is a 16-in. screw conveyor running the entire length of each tunnel. Slightly offset and above each conveyor are a number of gates in the bottoms of the

Coal is prepared for the kiln in a combination dryer-pulverizer unit machine

silos. Also, in the tunnel there is a track on which is mounted the F. L. Smidth and Co. "Exbiner" used for unloading the bins. The Exbiner rides these rails and is a device that by suitable leverage is clamped against the machined faces of each silo outlet gate and to the intake port in the conveyor top. By means of a short, tight-fitting screw conveyor the cement is transferred from silo to the main conveyor without danger of flooding. The Exbiner can be transferred from tunnel to tunnel by a cross track at the rear end of the building.

The four conveyors discharge to two cross conveyors, one being for ordinary cement conveyance and the other for plastic cement. These cross conveyors serve two bucket elevators enclosed in a concrete housing, and the cement is elevated to the top of the packhouses.

The Exbiner is driven by a 5-hp. motor and each of the four 16-in. conveyors are driven by a 10-hp. motor through a Pacific gear reduction unit with an extended shaft from the gear train to the conveyor. This long shaft is for convenience of erection and arrangement.

Each of the cross conveyors is driven by a 10-hp. motor through a Cleveland reduction unit, and the two bucket elevators are driven by individual 25-hp. motors through Link-Belt silent chain drives and enclosed gear reductions.

The cement elevators discharge to a rotary screen over a short 16-in. screw conveyor, and the screened cement is delivered by either of two longer cross conveyors to the two steel hopper-bottom bins over the three-tube Bates valve-bag packers.

These bins are equipped with the Fuller-Kinyon alarm system that indicates to the operator when the bins are full or empty through an electrical contact system.

The oversize from the screen, being only foreign materials, tramp iron, etc., is spouted to waste.

The rotary screen and the short conveyor are driven from a 10-hp. motor through a Pacific gear reduction unit and open chains. The longer cross conveyors to the sacker bins are driven each by a 10-hp. motor through a Cleveland reduction unit and the Bates sackers by 20-hp., 1170-r.p.m., induction motors.

Unsual Dust Collecting System

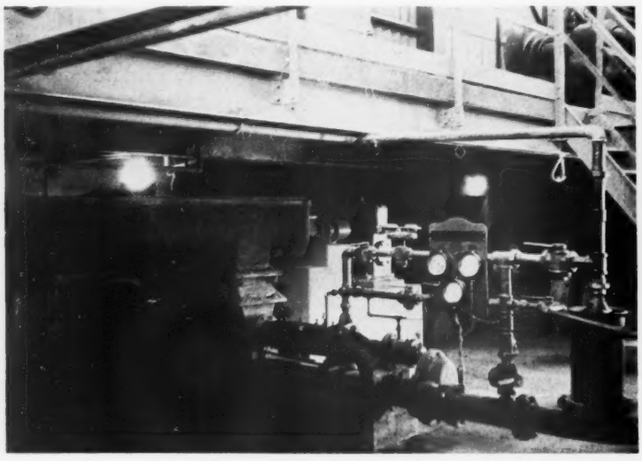
The Bates packers are elevated sufficiently for the filled sacks to slide down an incline resembling a grizzly to a point where the sacker loads them into his truck. The lighter dust is taken away by a size 45 "Sirocco," Type E, fan and delivered to a Sly dust collector, each sacker being provided with an individual Sly unit.

The heavier dust or cement from broken sacks, etc., that sifts through the grilling falls to a steel hopper under which rests a 2-in. Fuller-Kinyon pump that delivers the spill-back to the steel hoppers feeding the sackers. A second coarse screen or grizzly protects the Fuller-Kinyon pump from foreign materials.

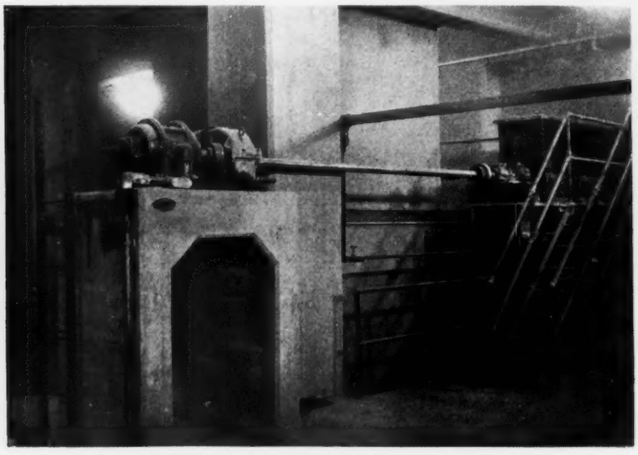
This arrangement is one of the few, if not the only one, of its kind in the world, and certainly solves a troublesome problem in a neat and efficient manner. The pumps are each direct-connected to a 5-hp., 865-r.p.m. motor and the Sirocco fans are direct-connected to 10-hp., 1160-r.p.m. motors.

Sack Cleaning

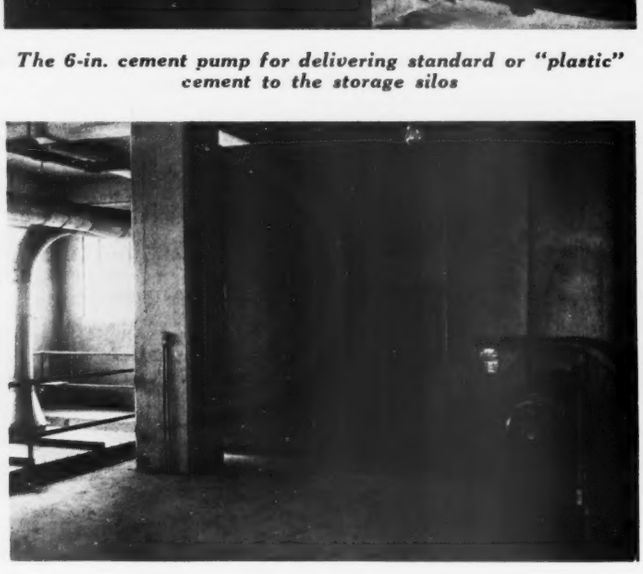
The sacks are elevated to the third floor



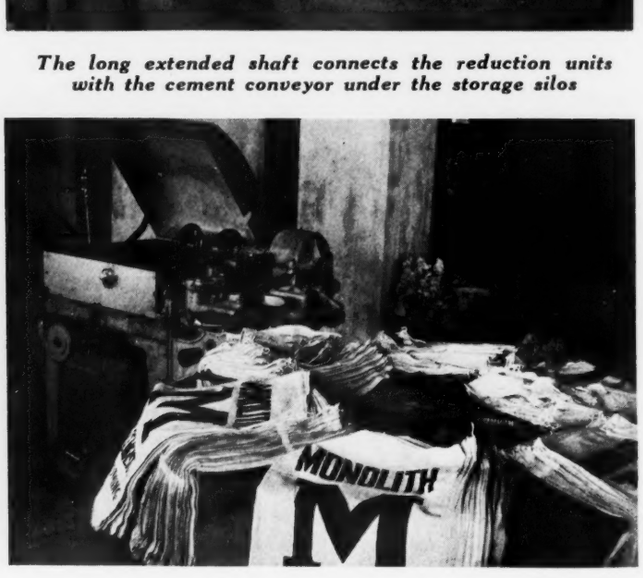
The 6-in. cement pump for delivering standard or "plastic" cement to the storage silos



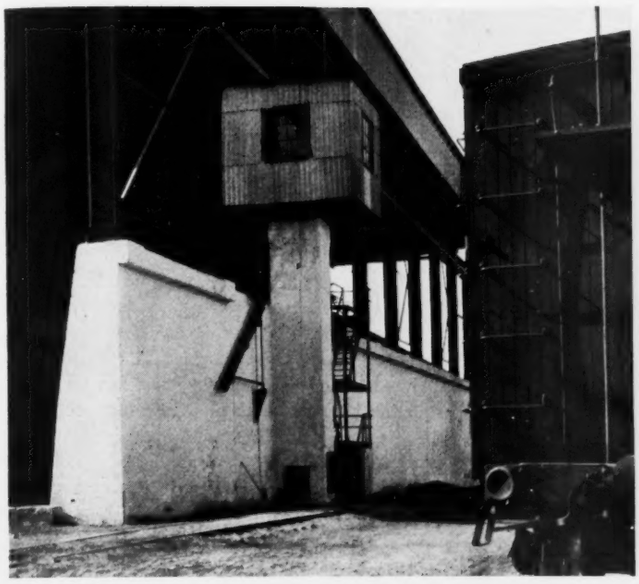
The long extended shaft connects the reduction units with the cement conveyor under the storage silos



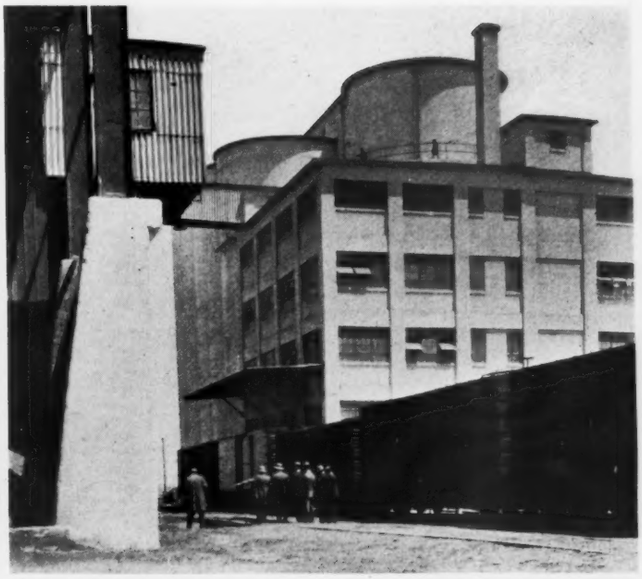
Dust collectors are provided for each packer and the bag cleaner



The automatic bag-tying machine has a capacity of 2700 bags per hour



Coal elevator handles also gypsite to and out of storage



The packhouse showing the water supply tanks mounted on the roof

of the packhouse by a Reliance 2-ton freight elevator and dumped to a Bethlehem Foundry and Machine Co. continuous bag cleaner having a capacity of 5000 bags per hour. This cleaner is of the tumbling barrel type and discharges to a short 36-in. horizontally running sorting belt. This moves at approximately 1 ft. per 5 sec. and is driven by a 5-hp. motor through a Cleveland reduction unit and enclosed chain drive. A Pioneer belt is used. The cleaner is driven by a 20-hp. motor through a Pacific gear reduction unit.

The dust from the perforated barrel of the cleaner is discarded via a short screw conveyor and used about the plant for concrete work. The finer dust is picked up by a No. 50, Type E, Sirocco fan of the American Blower Co. and delivered to a third Sly dust collector, and this dust is returned to the sacking system. The fan is direct-connected to a 10-hp. motor. The screw conveyor is driven by a 5-hp. motor through a Pacific gear reduction unit.

Heating System

On each floor of the packhouse are located four heating units called "Aerofins," made by the B. F. Sturtevant Co. This heater has a radiating surface similar to that of an automobile with steam passing through the inner passages. A small fan circulates air through the open ducts, passing the heated air into the room. All of the "Aerofins" are mounted near the ceiling in the various rooms.

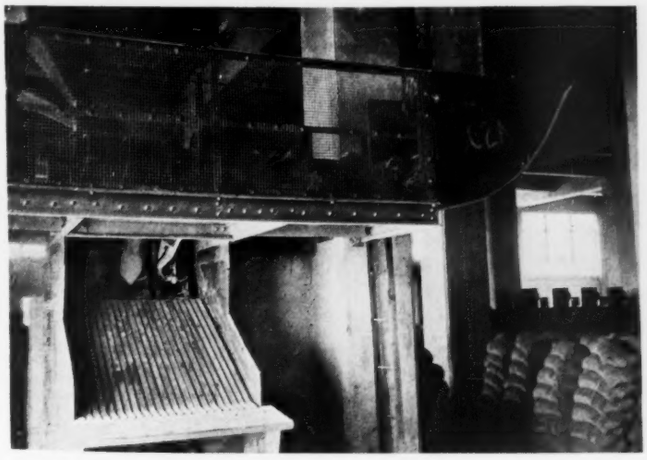
Bag Tying

On the same floor with the bag cleaner is located a Bates automatic bag tyer which when fed by one operator has a capacity of 2700 bags per hour. All the operator does is feed the bags into the machine and they are tied automatically, leaving a tie that is considerably stronger and more satisfactory than that secured from hand tools, as the tension and number of twists of the wire tie is always the same.

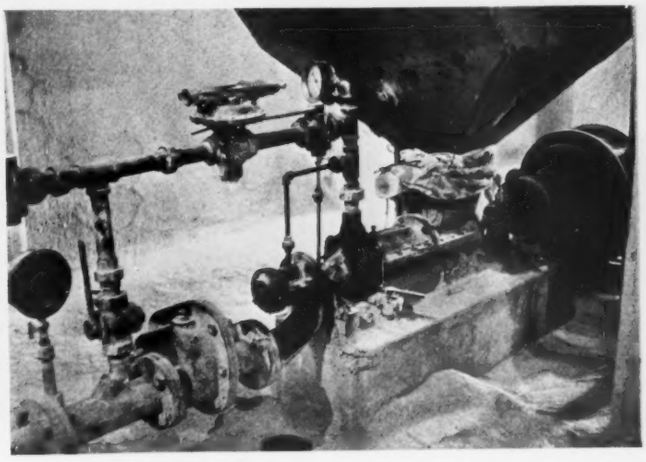
The empty sacks, after being tied, are bundled and dumped down a steel chute to a point where the sacking machine operator can get at them conveniently.

Office and Laboratory

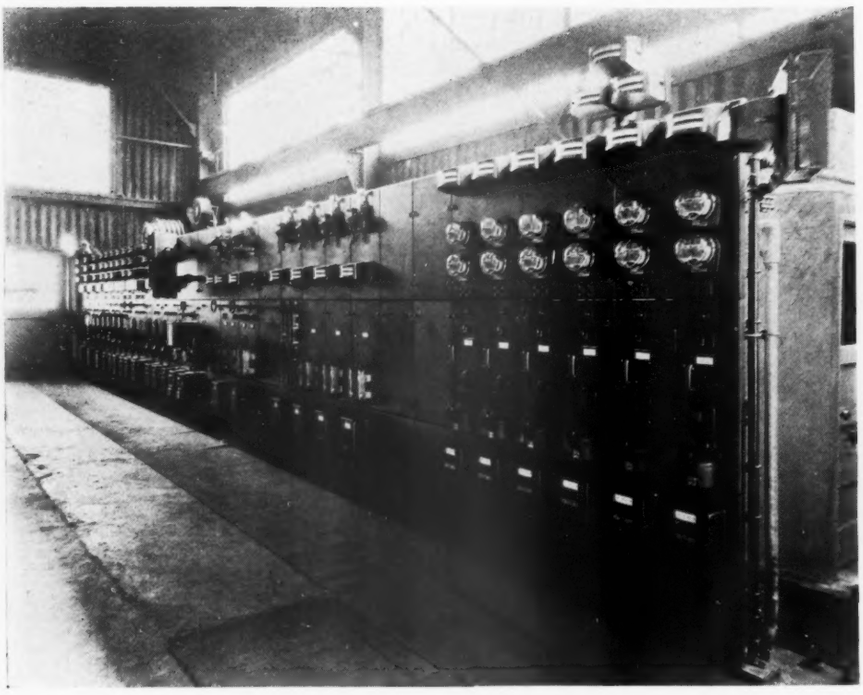
At the entrance to the plant a neat, reinforced-concrete, one-story office building has been built of an architectural design that suggests Spanish origin and southern California. The main floor contains separate offices for the auditor and his staff, superintendent's office and the laboratory. The laboratory has a separate room for mix control and for analytical work, and in addition a separate scale room is provided, chief chemist's office and a first-aid room that in neatness of appearance and array of equipment would do justice to any hospital.



Lower end of the packer. Empty bags are delivered to the operator through the chute at the right



Under each packer is installed a 2-in. cement pump to recover the greater part of the spillage



The main switchboard—located in the building adjacent to the grinding rooms

In the basement all the physical testing equipment is housed, which includes a "Ro-Tap" screen, an Olsen hydraulic tensile-strength machine, moist closets, etc.

Shop

The company has built a very modern shop equipped with all the machinery necessary to make practically all repairs that may be necessary. The equipment includes a Rockford Machine Tool Co. shaper, an Oster Manufacturing Co. power-driven pipe threader for the large diameter pipe, a Toledo pipe machine for smaller work, an American radial drill press, a Peerless hack saw, a Hendrie and Bolthoff emery wheel, a smaller Buffalo drill press, a South Bend lathe having a 12-in. swing and a 14-ft. bed. All the units are driven by individual direct-connected motors of 3 hp. each or less. The structure also houses the carpenter shop, equipped with a power rip and band saw and a blacksmith shop having a Little Giant Co., Mankato, Minn., trip hammer. All these units are also driven by direct-connected individual motors. A large stock of repair parts is kept on hand in the warehouse section, which is under the same roof as the shop. At the far end of the building track facilities, including a suitable pit, are provided for housing overhauling the railroad locomotive.

Water Supply

Near the plant the company has drilled two wells, one being down 1600 ft. and the other 1300 ft. The former supplies all the water needed for the operation of the plant. This well is equipped with an Ingersoll-Rand air-lift discharging into a circular concrete reservoir, from which the water is pumped to a 100,000-gal. concrete tank located above the packhouse.

In order to conserve water, a 50,000-gal. capacity reservoir has been built to which will drain all cooling waters from compressors or from the various water-cooled bearings, and a centrifugal pump will deliver this recovered water to the raw Unidan mill.

The compressor for supplying air to the lifts is located in the machine shop a short distance from the wells, and is an Ingersoll-Rand, Type ER-2, 13x8x10-in., direct-connected to a 70-hp. Electric Machinery Manufacturing Co. synchronous motor, 2200 volts, 300 r.p.m. The vertical receivers for this compressor set outside the shop.

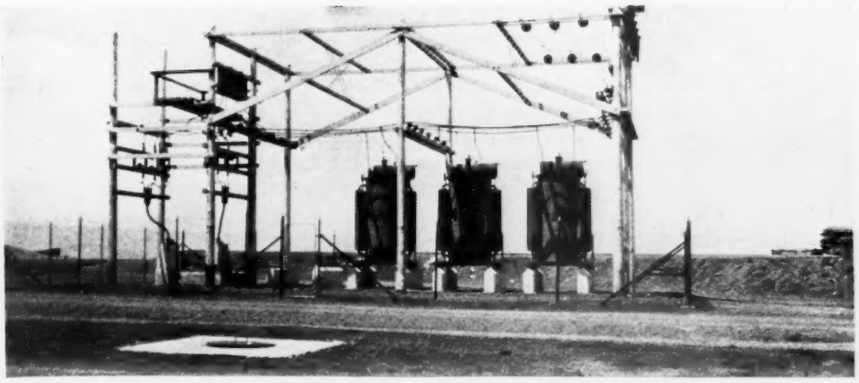
Power House

In addition to the features already mentioned that are housed in the power house, viz., the Unidan mill drives, interlocking switchboard and "Capacitators," the power house contains the main switchboard for control of the entire plant. The switchboard was designed by F. L. Smidth and Co., and manufactured by the General Electric Co.

MOTOR SCHEDULE, MONOLITH PORTLAND CEMENT CO., LARAMIE, WYO.

Equipment	Motor make	Number of units	HP.	R.P.M.	Drive
Primary crusher	Gen. Elec.	1	200	580	Belt
Car puller	Gen. Elec.	1	15	1165	Direct-connected
Pan elevator	Gen. Elec.	1	60	865	†Cleveland, 9¾ :1
Reciprocating feeder	Gen. Elec.	1	10	865	De Laval
Hammermill	Gen. Elec.	1	300	703	Direct-connected
Belt con. (incl.)	Gen. Elec.	1	30	1165	†Cleveland, 43 :1
Belt con. (hor.)	Gen. Elec.	1	10	1170	†Cleveland, 43 :1
Raw "Unidan" mill	Elec. Mach.*	1	600	720	Tronyon-Symetro, 720 :20.6
Slurry pumps	Gen. Elec.	2	25	1165	Direct-connected
Correction tank	Gen. Elec.	1	25	1165	Pac. G. & T., 29 :1
Mixing tank	Gen. Elec.	1	25	1165	Pac. G. & T., 29 :1
Traveling agitator mechanism	Gen. Elec.	1	5	575	†Cleveland, 48 :1
Traveling agitator	Gen. Elec.	1	10	575	Foote, 12 :1
Compressor (slurry)	Elec. Mach.*	1	140	277	Direct-connected
Slurry pumps to kiln	Gen. Elec.	2	30	1165	Direct-connected
Slurry feeder	Ideal	1	5	1200	S.-A. var. speed trans. and Cleveland, 50 :1
Dust elevator	Gen. Elec.	1	10	1160	Pac. G. & T., 20½ :1
Dust screw conveyor	Gen. Elec.	1	5	1150	Pac. G. & T., 57.5 :1
Kiln	Gen. Elec.	1	50/100	400/1200	Pac. G. & T., 13.3 :1
Kiln, induced draft fans	Gen. Elec.	1	40	1750/2200	Direct-connected
Kiln coal feeder	Gen. Elec.	1	5	450/1200	Pac. G. & T., 15 :1
Skipulter	Gen. Elec.	1	15	550	8-in. belt
Clinker elevator	Gen. Elec.	1	10	870	L.-B. silent chain
Pyrator, coal feed	Gen. Elec.	1	5	860	Pac. G. & T.
Pyrator, coal feed belt	Gen. Elec.	1	3	1160	Fawcus
Pyrator, reciprocating feeder	Gen. Elec.	1	2	500/2000	†Cleveland, 40 :1
Pyrator fan	Gen. Elec.	1	5	1740	Direct-connected
Pyrator, ball elevator	Gen. Elec.	1	5	870	†Cleveland, 32 :1
Pyrator, main drive	Elec. Mach.*	1	250	164	Direct-connected
Gypsum feeder	Gen. Elec.	1	3	450/1800	†Cleveland, 20 :1
"Unidan" finishing mill	Elec. Mach.*	1	600	720	Tronyon-Symetro, 720 :20.6
Fuller-Kinyon pump	Gen. Elec.*	1	115	277	Direct-connected
Air compressor tor F.-K. pump	Elec. Mach.	1	60	860	Direct-connected
Screw conveyor to F.-K. pump	Gen. Elec.	1	10	1160	†Cleveland, 19½ :1
Kiln burner fan	Gen. Elec.	1	40	1750/2200	Direct-connected
Kiln burner coal screw	Gen. Elec.	1	5	450/1200	Pac. G. & T., 15 :1
Fuller coal pump	Gen. Elec.	1	15	875	Direct-connected
Shop compressor	Elec. Mach.*	1	70	300	Direct-connected
Coal storage elevator	Gen. Elec.	1	25	865	L.-B. silent chain
Coal storage crusher	Gen. Elec.	1	40	.....	.....
Pack house	.....	...	...	.....	.....
Bates sacker	Gen. Elec.	2	20	1170	Direct-connected
Tunnel conveyors	Gen. Elec.	4	10	1160	Pac. G. & T., 19.8 :1
Tunnel cross conveyors	Gen. Elec.	2	10	1160	†Cleveland, 24½ :1
Fuller-Kinyon dust pumps	Gen. Elec.	2	5	865	Direct-connected
Exbiner	Gen. Elec.	1	5	1150	Direct-connected
Sly fan on bag cleaner	Gen. Elec.	1	10	870	Direct-connected
Sly sacker fans	Gen. Elec.	2	10	1160	Direct-connected
Cement bucket elevator	Gen. Elec.	2	25	865	L.-B. silent chain
Cement rotary screen	Gen. Elec.	1	10	1160	Pac. G. & T., 25½ :1
Sack cleaner	Gen. Elec.	1	20	1170	Pac. G. & T., 14 :1
Sack cleaner sorting belt	Gen. Elec.	1	5	1170	†Cleveland, 60 :1
Cross conveyors to packers	Gen. Elec.	2	10	1160	†Cleveland, 24½ :1
Sack cleaner screw conveyor	Gen. Elec.	1	5	1150	Pac. G. & T., 15.3 :1

*Synchronous motors, all others of the induction type. †Right-angled connection.



Transformers banks for stepping down the 33,000-v. current

To provide emergency power to operate the kiln in case of outages on the high-tension circuits from the source of power, the company has a Sterling gas engine, which, by means of a magnetic clutch may be connected to one of the motor-generator sets used for d.-c. current supply. Thereby both a.-c. and d.-c. current can be produced The engine is a Model GRC-8, No. 112, Rotation L, 300-hp. at its maximum r.p.m. (1500) with a minimum r.p.m. of 1200.

Behind the main switchboard is built a battery room containing a 60-cell storage battery which is connected with a small switchboard so equipped that in the event of power failure the batteries supply lights in the power house; this insures that the heart of the plant will have lights at all times.

In addition to the motor generator set driven by the Sterling engine is a separate identical unit that is not, of course, connected to a separate engine, but operates from the line and supplies direct current to the various variable speed, direct-current motors.

For convenience of repairs a 5-ton Northern crane spans the power house.

Personnel

The offices of the Monolith Portland Cement Co. occupy the top floor of the A. G. Bartlett building at 215 West Seventh street, Los Angeles, and the offices of the Monolith Portland Midwest Co. are in the Security building, 650 17th street, Denver, Colo. The executive officers of both companies are as follows: Monolith Portland Cement Co., president, Coy Burnett; chairman of executive committee, Alfred F. Smith; vice-president and general manager, Carroll A. Low; secretary and treasurer, J. J. Calkins; production manager, W. S. Trueblood; sales manager, F. R. Brownell. Monolith Portland Midwest Co., president, Coy Burnett; vice-president, Carroll A. Low; secretary and treasurer, J. J. Calkins; production manager, W. S. Trueblood; director of sales, security department, H. C. Gardner; district manager, Denver, Colo., S. D. Clinton. F. G. Anderson is superintendent of the Monolith Portland Midwest Co. and D. R. Wiliams is chief chemist.

Acme Limestone Installing Pulverizing Equipment

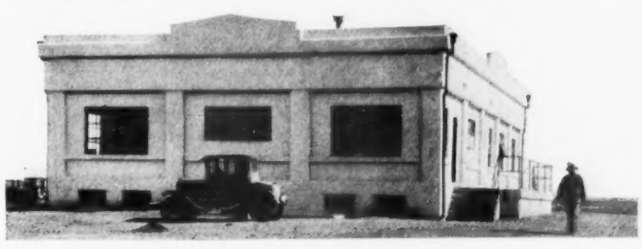
AN ADDITIONAL unit for the production of limestone sand, agricultural limestone and rock dust for dusting coal mines is being installed by the Acme Limestone Co., Alderson, W. Va. The management expects to have this plant in operation in the very near future with an output of about 1200 tons per shift of 10 hours.—*Covington* (Va.) *Virginian.*

States Improved 29,252 Miles of Highways Last Year

DURING 1928 THE 48 STATES improved a total of 29,252 miles of their highway systems, according to figures received from the states and compiled by the Bureau of Public Roads of the United States Department of Agriculture. This is an increase of 2,530 miles over the 1927 figure.

The 1928 total includes 8,675 miles of graded and drained roads and 20,577 miles of new surfacing. Of the roads surfaced 13,843 miles were previously unsurfaced and 3,587 miles were previously improved with a type of surface lower than the one newly applied. The remaining 3,147 miles were previously improved with the same type of surface, and the work done during the year is therefore classed as reconstruction.

The total of 20,577 miles of surfacing placed is classified by types as follows: 1,200 miles of sand-clay and topsoil; 9,623 miles of gravel; 1,006 miles of water-bound macadam; 1,979 miles of bituminous macadam; 225 miles of sheet asphalt; 373 miles of bituminous concrete; 6,055 miles of concrete; and 116 miles of brick and block pavements.



Plant office, Monolith Portland Midwest Co., Laramie, Wyo.

Texas heads the states in the year's improvement with 2,356 miles. Kansas with 1,785 miles, ranks second; Arkansas, with 1,673, is third. Iowa improved 1,345 miles and Illinois, 1,344, ranking fourth and fifth respectively. Minnesota, with 1,243 miles, is sixth; North Dakota, with 1,230, is seventh; New Mexico, with 1,052, is eighth; Kentucky, with 1,021, is ninth, and Ohio, with 928 miles is tenth.

The state systems at the end of 1928 had 306,442 miles of highways, according to figures given to the bureau. Of this total, 193,138 miles were surfaced roads, 31,755 miles graded and drained, and 81,549 miles were unimproved and partly graded highways. This is an increase of 13,090 miles over the 1927 total figure. The surfaced mileage is made up of the following types of pavement; 13,499 miles of sand-clay and topsoil; 93,124 miles of gravel; 18,142 miles of waterbound macadam; 15,200 miles of bituminous macadam; 1,498 miles of sheet asphalt; 5,392 miles of bituminous concrete; 42,957 miles of concrete, and 3,326 miles of brick and other block pavements.

During 1928, the states spent $764,648,134 for state highway and bridge work under the supervision of the state highway departments, made up as follows: For construction and right of way $536,294,303; for maintenance $158,878,573; for equipment and machinery $20,505,483; for interest on outstanding bonds and notes $37,637,034, and for miscellaneous expense $11,332,741. The states also paid out $27,016,499 in retirement of the principal of outstanding bonds and notes and transferred $35,885,350 to county and town funds for local roads, making a total disbursement of $827,549,983. At the end of 1928, there was an unexpended balance of $205,221,565 for all states.

For 1928, there was available to the 48 states for state highway and bridge work under supervision of state highway departments a total of $1,035,486,474, made up of an unexpended balance of the previous year's funds of $186,159,876 and a total income of $849,326,598. Of the total income, motor vehicle fees of $259,134,820 and gasoline tax receipts of $234,163,826 allotted to state highways represent over 58%. Sales of state bonds and notes issued for state highways of $121,483,599 form more than 14% of the total income, while federal-aid fund allotments of $80,798,365 represent more than 9½%. Highway taxes levied in several states amounted to $11,955,782, and appropriations by several states amounted to $42,468,386. Miscellaneous incomes were reported as $12,611,916 and funds transferred from local authorities as $86,709,904.

Design of Sand and Gravel Washing and Screening Plants

Part V—Washing—Sand Settling Tanks—Screening

By Frank M. Welch
Chief Engineer, American Aggregates Corp., Greenville, Ohio

PART I of this series covering some of the fundamentals of the industry was published in the April 27 issue, Part II on plant design and stripping and excavation methods in the June 8 issue, Part III on transportation and elevation in the July 6 issue and Part IV on conveying, scalping and crushing in the August 3 issue.

Washing

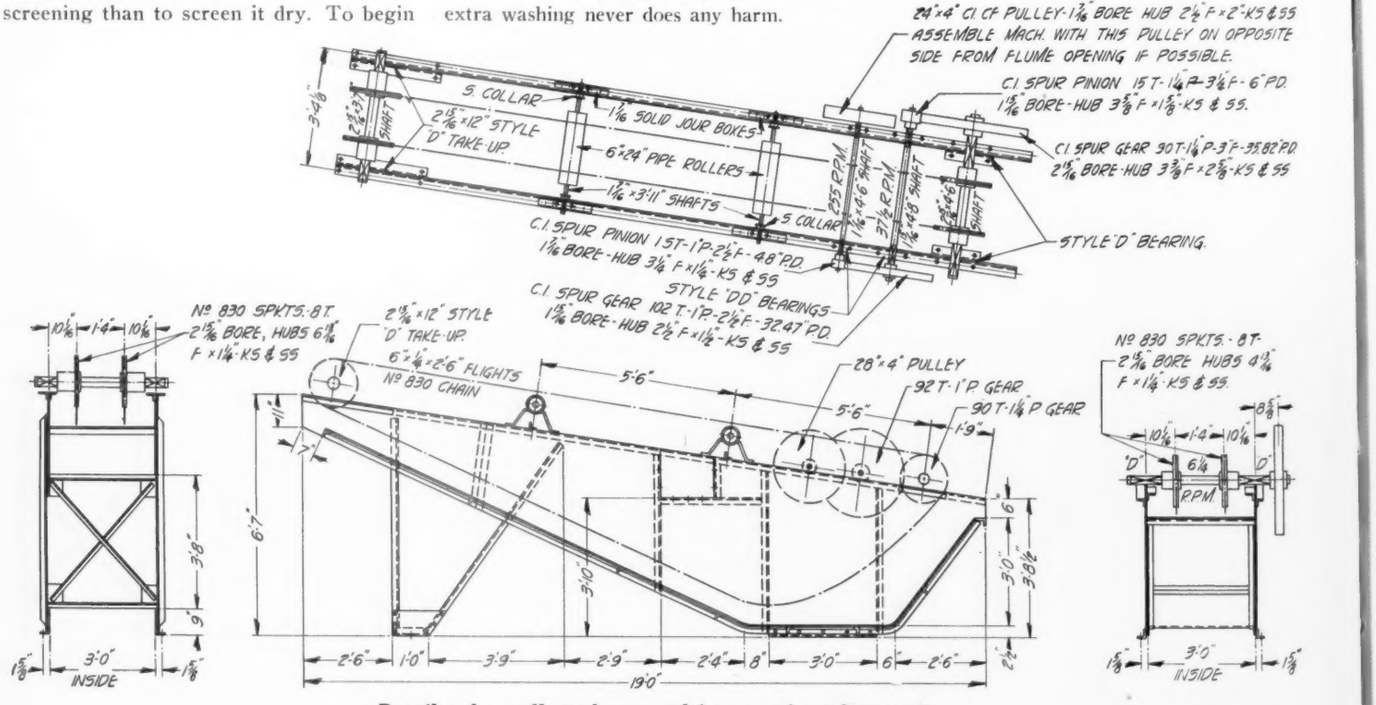
With the specifications dictated by engineers and architects becoming more rigid every year, the importance of thorough washing of all aggregates is constantly increasing in importance. Even if this were not the case, it is really cheaper to wash the material while screening than to screen it dry. To begin with, no material is dry every day. If there is any moisture in it whatever, the tendency to clog the screens cuts down the daily capacity greatly. The capacity of any dry screening plant can usually be doubled by the addition of the washing process on account of the fact that the water greatly hastens the material through the screens. In fact, outside of a few remote or outlying instances, dry screening is not attempted any more. It is no longer a question of whether or not the material should be washed, but whether or not it should receive a double washing or scrubbing.

In all of the most modern plants, scrubbers are now used. This is not caused only by the constantly increasing strictness of specifications but also by the fortunate fact that little if any additional expense is incurred by the scrubbing process. It is true that some deposits appear to require little or no washing, especially where the excavating is done by the pumping method, but even the best of these will be pretty dirty at times and extra washing never does any harm.

In plants where the unit screens are used, such as the conical and single cylindrical type, the scrubbers also consist of a separate unit and are located where otherwise the top-most screen or screens would be placed. Where the multiple jacketed cylindrical screens do the grading, the scrubbers are attached to and are part of the main screen. With this arrangement no height is wasted, very little additional first cost is created, and the material receives a thorough scrubbing before entering the ordinary washing process. In fact the ordinary washing process is converted into a rinsing or rewashing action in which the efficiency is increased many fold, because the dirt, clay or loam has been knocked loose in the scrubber and a large percentage of it has gone into solution in the first water.

Two-thirds to three-fourths of the washing water is fed to the scrubber through the main feed spout with the material. The interior of the scrubber, consisting of blades, barriers, vanes, baffles or paddles of various designs, lifts and scrubs the material over itself while submerged in water. The sand scrubs the gravel and the gravel scrubs the sand as it rolls over itself while passing through the revolving drum.

These scrubbers are made of various lengths and diameters according to the capacity and amount of washing required.


24"x4" CI CF PULLEY-1 7/16" BORE HUB 2 1/2" F x 2" KS & SS
ASSEMBLE MACH. WITH THIS PULLEY ON OPPOSITE SIDE FROM FLUME OPENING IF POSSIBLE.
C.I. SPUR PINION 15T-1 1/4" P-3 1/2" F-6" P.D.
1 7/16" BORE-HUB 3 3/8" F x 1 7/8" KS & SS.
C.I. SPUR GEAR 90T-1 1/4" P-3" F-35.82" P.D.
2 15/16" BORE-HUB 3 3/8" F x 2 3/8" KS & SS
STYLE "D" BEARING.
5 COLLAR
2 15/16" x 12" STYLE "D" TAKE-UP.
1 7/16 SOLID JOUR BOXES
6"x24" PIPE ROLLERS
1 7/16" x 3'11" SHAFTS
5 COLLAR
255 R.P.M.
1 7/16" x 46 SHAFT
37 1/2 R.P.M.
1 7/16" x 48" SHAFT
C.I. SPUR PINION 15T-1"P-2 1/2" F-48" P.D.
1 7/16" BORE-HUB 3 1/2" F x 1 1/4" KS & SS
STYLE "DD" BEARINGS
C.I. SPUR GEAR 102 T-1"P-2 1/2" F-32.47" P.D.
1 15/16" BORE-HUB 2 1/2" F x 1 1/2" KS & SS
Nº 830 SPKTS-8T.
2 15/16" BORE, HUBS 6 7/16" F x 1 1/4" KS & SS
2 15/16" x 12" STYLE "D" TAKE-UP.
6"x 1/4" x 2'-6" FLIGHTS
Nº 830 CHAIN
28"x4" PULLEY
92 T-1"P GEAR
90 T-1 1/4" P GEAR
5'-6"
1'-9"
Nº 830 SPKTS-8T.
2 15/16" BORE HUBS 4 1/16" F x 1 1/4" KS & SS
R.P.M.
3'-0" INSIDE
19'-0"

Details of an all-steel power-driven sand settling tank

As the sand, gravel and water pour from the scrubber on to the first screening surface, the original dirt-laden water immediately passes through the screens to the settling tanks with the sand. Simultaneously with this passing, a spray of clean water is introduced on to the material which continues throughout most of the length of the screen, re-washing and rinsing all the way—the second water also passing to the sand tanks. This spray of clean water is supplied from a 2-in., 2½-in. or 3-in. pipe passing longitudinally through the entire screen and perforated with small holes properly spaced and at a suitable angle on the under side to thoroughly spray all the material all the time it is in the screen. In the single unit screens fresh water is added either as the material enters each screen or as it leaves, or both.

Regarding the advantages of washing, there are some communities where it is considered preferable to leave the dirt in the material when preparing it for gravel roads, but a final analysis has proved—even in road work—that the washed material has a distinct advantage in the long run.

Sand Settling Tanks

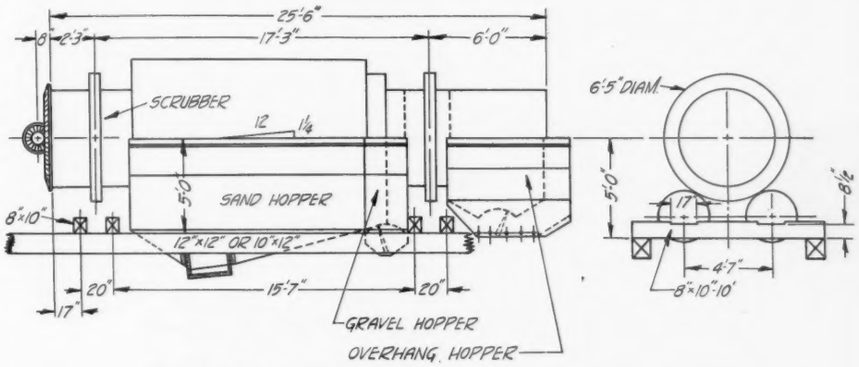
Settling tanks exist in several forms. Two or three designs of automatic tanks have been perfected, which gives satisfactory results. The operation of all of them depends upon the weight of the sand in the tank, when filled to a certain point, over-balancing counter-weights. This automatically tilts the tank, simultaneously opening one or more valves at the bottom, thereby allowing clean sand to discharge. An overflow spout is provided at the top of the tank where the bulk of the water, laden with clay or loam in solution, passes to a sluiceway leading to some low spot on the property which has already been excavated. If any dirt remains in the water not in solution, it is light enough to float on top of the water and pass out with it. The tanks are usually of steel construction supported on knife edge fulcrums to increase their sensitiveness.

Stationary Settling Tanks

Stationary settling tanks of wood, concrete or steel construction are still in use at some plants, where the nature of the operations requires a man on the plant, who has ample time to attend to the opening and closing of the tank at intervals. These tanks operate on the same gravity principle of the automatic tanks, except that they do not discharge automatically. Regardless of whether the automatic tank will eliminate a man or not, its use is advisable, as it is by far more reliable than the average available man for this purpose. The man can be distracted by other duties or attractions, while a valve is open, resulting in the flooding of the sand bin, etc.

Power-Driven Settling Tanks

During the evolution and perfection of the automatic tank, several designs of power-driven settling tanks were built, many of which are now in use. They also have the gravity principle of the dirt-laden water overflowing at the top and the clean sand settling to the bottom. The sand, in these tanks, instead of discharging through a valve near the bottom, is dragged up an inclined side of the tank, by means of a flight conveyor or cast iron screw conveyors.

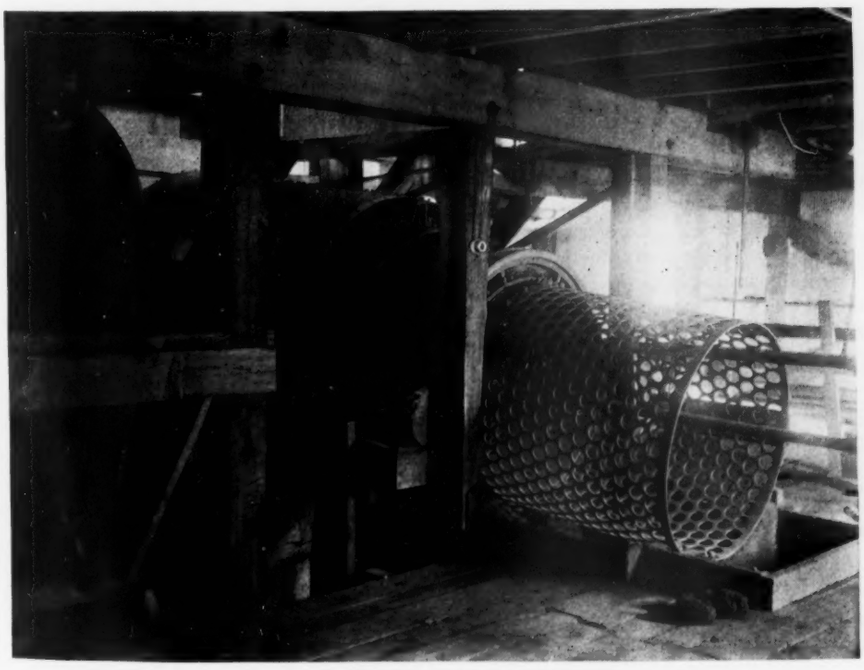


Details of a simple, rugged trunnion type of gravel screen

These power driven tanks have their advantages and disadvantages, and therefore their proper place under certain conditions. Their chief advantage consists in the fact that the sand discharge from them is much dryer than the soupy consistency coming from the bottom discharge tanks. Most of the larger cities have ordinances prohibiting trucks from which water is dripping, to pass through the streets and therefore this tank finds a ready market at plants catering to city truck trade. Several operators are also installing this type of tank on account of the dry product eliminating the costly necessity of patching railroad cars. This type of tank has the further advantage of discharging its product 3 ft. to 5 ft. higher than the intake, thereby gaining 7 ft. to 9 ft. of head room which is of great advantage where large bin storage is needed.

The disadvantages of the power driven tanks consist of their high first cost; the floor space they require; the fact that they require power instead of operating automatically; their limited capacity; and the fact that most of them seem to lose too much of the very fine sand needed in the proper grading of commercial material. Even bearing these facts in mind we find that the power driven sand settling tank is increasing in popularity.

The amount of water necessary for adequate washing depends upon the percent-

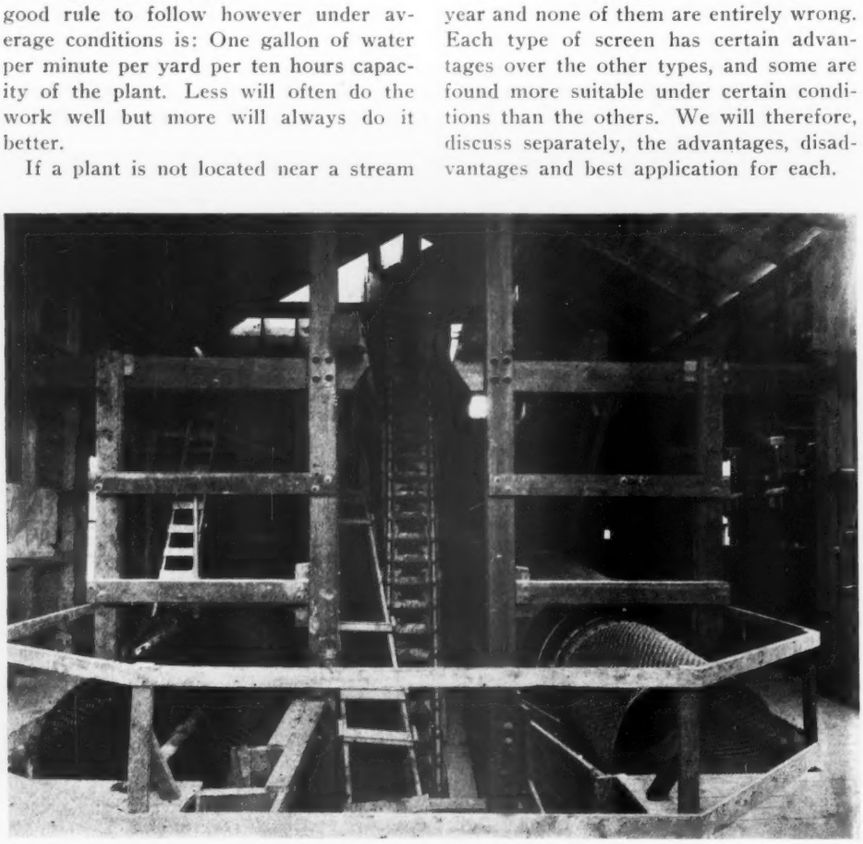


A typical triple-jacketed gravel screen, Keystone Gravel Co., Dayton, Ohio

age of dirt to be eliminated. Regardless of washing requirements, too much water cannot be used, because every gallon of additional water increases the screening capacity of the plant as well as more thoroughly cleansing the material. A good rule to follow however under average conditions is: One gallon of water per minute per yard per ten hours capacity of the plant. Less will often do the work well but more will always do it better.

If a plant is not located near a stream or lake, sufficient water supply is often unavailable, even though several deep wells are sunk. Under such conditions the same water or part of the same can be used over and over. This is accomplished by forming a lake in a portion of the pit which has been worked. The refuse together with the bulk of the water, which overflows the settling tank, is spouted to one end of the lake. From a remote end, clean water is pumped, having freed itself of clay and loam by settling, while flowing from one end of the lake to the other.

Unless this lake is very large, clearer water is obtained at the lower end if it is divided near the center by a dam. A weir is then constructed near the middle of the dam, all of which assures only the top water entering the clear end of the lake.



Interior of a modern gravel plant showing the triple-jacketed screens in place (J. N. Dugan Sand and Gravel Co., Cincinnati, Ohio)

Screening

Efficient and sharp screening is accomplished by a large variety of screens. To a certain extent, the type of screen used is a localism, although in some communities every type imaginable can be found. Each type has its champion who could never be convinced that this system could be improved upon; he has "tried them all." However, they are all improving their own systems every winter, and each method is becoming more efficient each year and none of them are entirely wrong. Each type of screen has certain advantages over the other types, and some are found more suitable under certain conditions than the others. We will therefore, discuss separately, the advantages, disadvantages and best application for each.

The gravity screen, which is still in use in a few localities is made in three different forms, screen bars, wire cloth, and perforated metal. Those made up of screen bars commonly known as grizzlies, have the greatest capacity of the three, but under ordinary market conditions, too many flat stones are permitted to pass through them to justify their use. They are also too bulky for fine screening and are seldom used for any except coarse separation such as scalping. Bars rolled with a tapered cross section can be obtained, and they are much superior to the ordinary flat bars, in that the clogging is greatly reduced. The thin edge, is installed below.

The gravity screens made out of perforated metal have much smaller capacity and clog more readily. However better results are obtained from them if the perforations are slotted, lengthwise of the slope, instead of being round. Under most conditions, wire cloth gives the best results, especially if made with slotted openings instead of square. It will wear out faster than the other types, but is easy to replace and has good capacity if plenty of water is used in the process.

Gravity screens should only be used, if ever, where a large volume of water is necessarily available, such as in pumping operations in which the material is pumped directly on to the screens, or at least where all the water pumped with the material goes to the screens. It would not pay to pump sufficient water to the top of a plant for the single purpose of washing dry material through a gravity screen on account of the large volume required. Gravity screens should be set at an angle of from 30 deg. to 40 deg. according to the amount of water used and the percentage of coarse aggregate in the material. More height is required for gravity screens than for any other type. Therefore, considering the height, clogging, and low screen capacity per square foot of surface, the gravity screen is rarely considered in designing a modern plant, and then only under extraordinary conditions.

Rotary Screens

The conical screen, made up in separate units for each separation has been most universally tried out and doubtless predominates in general use, especially in the smaller plants. Its first cost is low and although a separate driving connection is required for each screen, small power is required and wide distribution to the bins is made possible. If not overloaded they thoroughly wash and separate the material. However they are seldom used in the larger plants, first because so many of them are required to obtain the desired capacity, and second because their use requires one end of the plant to be 10 to 25 ft. higher than the other. The large modern plant must have the tops of the bins all on the same level so that any grade of product may be spouted to any bin or any mixture produced.

Cylindrical screens made up in separate units for each grade and arranged similar to the standard conical screen layout make up a plant of excellent design, providing not too many separations are required by the market they are serving. Although this design has the same disadvantage of requiring one end of the plant to be much higher than the other, the screens can be made as large as desired, and a greater capacity obtained than with the conical units.

Jacketed Screens

The larger double- or triple-jacketed cylindrical screen, separating most of the grades with the one unit, is widely used in the larger plants. Although it is a more expensive equipment in first cost, it centralizes the operation and simplifies the driving machinery. It permits all grades to be mixed and stored in any desired form. Although 50 to 80 cars of bin storage is often provided under the screen of

some of the largest plants, yet with the one or two big triple-jacketed screens doing all the scrubbing, washing and separating, the head of the conveyor is not as high above the ground as in the smaller plants using the unit screen for producing each grade.

These double- and triple-jacketed screens, whose real origin was in the crushed-stone industry, are made up in widely varying design. The earlier ones were mounted on spiders hung on a shaft passing through the center of the inner cylinder. These spiders, however, were found to impede the flow of the material through the screens and to prevent the insertion of water pipes for washing and spraying purposes through the screens. The next step therefore, was to mount the feed end on trunnions and supply an overhanging spider at the discharge end, which, being equipped with a gudgeon, was supported in a large bearing. The trunnion ring at the head end and the spider at the tail were connected by heavy angles, I-beams, channels or pipes, to which the perforated plates or wire cloth were attached.

In our own operations, we have obtained the most satisfactory results from screens supported on trunnion rings at both the feed and discharge ends. This feature readily permits spray pipes to extend throughout the length inside the screens and gives easy access to the interior.

There appears in most deposits of the United States a surplus of material which has passed through say ½-in. or ⅜-in. perforation and has been rejected by ⅛ in. or 1/10 in. This aggregate is variously known in different markets as grits, pea gravel, shot and coarse sand. This surplus has been caused by the maximum restrictions on sand specifications and the minimum restrictions on gravel. The result is that additional fine screening capacity has become necessary in most districts and separate sand screens of the revolving or vibrating type are found in addition to the sand jacket on the main gravel screens.

Vibrating Screens

At this point, a few words should be given to the vibrating screen, whose field and merits have greatly increased in the past few years. The prevailing surplus of finer aggregate in many markets and the constant tendency of operators to overload their main screens, tend to increase the demand for vibrating screens not only for additional sand separating, but as auxiliary units for rescreening and cleaning certain grades of poorly prepared gravel. There are many types of vibrating screens on the market, several of which have come out quite recently. Some of these are of excellent mechanical design and although their main field of use is in metallurgical processing, yet they have solved many difficulties of the sand and gravel producers.

(To be continued.)

Over 7,000 Miles of Federal-Aid Highways Improved Last Year

DURING the fiscal year 1929, the federal government cooperated with the states in the improvement of 7022 miles of federal-aid highways, bringing the total mileage of the system improved with federal-aid to 78,096, according to figures of the Bureau of Public Roads of the United States Department of Agriculture. The year's mileage was improved in the 48 states and Hawaii by state highway departments working in cooperation with the federal bureau. There are approximately 188,000 miles of main interstate and intercounty highways in the federal-aid system, of which the above mileage and approximately an equal mileage built by the states without federal assistance is now improved.

The 7022 miles improved include 1056 miles of graded and drained earth roads, 563 miles of sand-clay, 1293 miles of gravel roads, 189 miles of waterbound macadam, 728 miles of bituminous macadam and bituminous concrete pavements, 3101 miles of portland cement concrete pavement and 48 miles paved with vitrified brick. Forty-four miles of bridges and approaches were also constructed.

In addition to the improved mileage, at the end of the year there were under construction with federal-aid 9526 miles, 8358 of which were undergoing initial improvement and 1168 were being given a higher type of surface than was provided in original construction. The estimated cost of the mileage under construction is $238,158,495, which includes federal funds in the sum of $96,500,347.

At the end of the year there were also approved for initial construction 1833 miles of highway and a further 1065 miles to receive a higher type of surface. The total cost of the approved mileage is estimated at $61,500,674, to which federal funds in the sum of $24,137,546 have been allotted.

Will Help Credit Risks of Rock Products Producers

AS A DECISIVE MOVE in a program launched to safeguard the public from the acts of irresponsible contractors, the Bureau of Contract Information has just been incorporated under the laws of Delaware.

Data on the manner in which each general contractor in the United States has fulfilled past contracts obligations are to be gathered and utilized in an effort to eliminate conditions that have made for irresponsibility in the construction industry. This was just announced by the Associated General Contractors of America and comes as the culmination of several years of debate about practices involved in the writing of surety bonds.

The undertaking is a venture in co-operation between surety companies and organized contractors, although it is independently organization as a fact-gathering and investigating agency.

Through this bureau the actual work of gathering and compiling the business histories of some 26,000 firms listed as construction companies is being started under the direction of S. M. Williams, who is the manager of the Engineering Construction Division of the Contractors' Association.

The highway departments of 46 states have gone on record as favoring the objects of the bureau and have pledged assistance to the extent of contributing their own data on the performance records of those contractors who have worked under contract with them.

Individual surety companies interested in the bureau have likewise agreed to pool their records. Questionnaires are rapidly being forwarded to contractors in order to obtain data direct from them as to their past performance and qualifications.

The losses to surety companies, material and supply interests and the construction industry generally are conceived to be equally great. By having a record of the past performance of contractors available through an unbiased fact-finding agency it is conceived that surety companies will be able to more intelligently judge of the ability of a contractor to carry through the contract on which they are called upon to write bonds guaranteeing performance. State and municipal officials will likewise be better able to judge of qualifications when making awards.

Census Committee Asks for Suggestions as to Form

WITH A VIEW to making the forthcoming census of manufactures as responsive as possible to the need of industry for accurate information concerning its own activities, the special advisory committee designated by Secretary Lamont has requested manufacturing organizations, trade associations, and individual manufacturers for advice and suggestions as to the form of the schedule to be used in the enumeration.

The subjects covered by the schedule used in the 1927 census are: Description of establishment; character of industry; time in operation; persons engaged; salaries, wages, and materials; products; power; coal consumed. The committee has invited suggestions concerning the form of questions under all of these subjects except production, which will be taken up directly by the Bureau of the Census with the industrial associations.

Rock Products Developments and Projects in Texas

Industries Keeping Pace with Other Industrial Expansion in the Largest State in the Union

By Walter B. Lenhart
Associate Editor, Rock Products

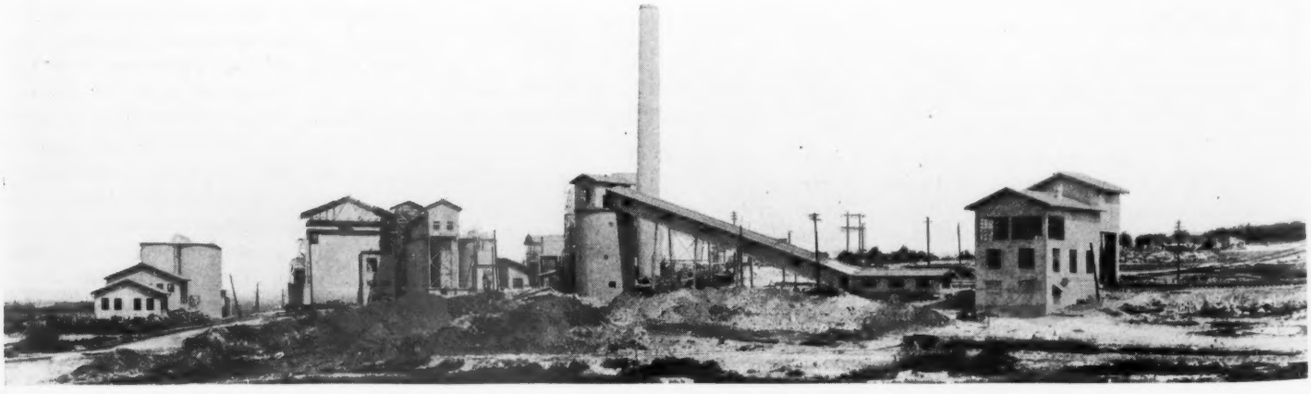
NO ARTICLE regarding Texas has been written in recent years without somewhere in its context a reference being made to its great size and its undeveloped resources. As one writer put it, "the word undeveloped resources is one of the most overdeveloped words between Los Angeles and the Mississippi river." But in the case of Texas, the undeveloped resources *are* being developed at a remarkable rate and the unproductive farm lands are fast being placed on a productive basis. Statistics show that Texas had in 1925 a total of 465,646 farms within its borders, leading the second ranking state of the Union by about 180,000 farms. There you have in one, a picture of its size and agricultural development. Again, for the last 10 years Texas has led in total crop valuation, averaging roughly $800,000,000 per year. Out of 15,500,000 bales of cotton produced in the United States in 1928 Texas accounted for 5,150,000 bales of this total. One can go on indefinitely, take the oil production, cattle raising, construction of various kinds and the figures all place Texas in a favorable position in the ranks with the other states of the Union.

With a state whose resources are so apparent then, the question is often asked as to why Texas has only until the last 10 years or so shown a tendency to industrialization, farm expansion and development of these natural resources, a lagging behind other states whose natural resources are far inferior to those of Texas?

The industrial development of the United States started in the east and gradually extended westward, but Texas was retarded in this development partly on account of its geographical location with respect to the Mississippi river section; the state being cut off from the east by the more or less swampy areas near the eastern boundries. After the states on its northern boundary and the states of the far west had become colonized as exemplified by California, then the development of Texas did start in earnest, but instead of starting in the eastern section of the state it began in the west and moved eastward. The oldest cities in Texas are in the western part and a little town near El Paso is one of the oldest towns in the United States.

The Trinity plant at Houston is one of the most attractive in the state

Texas now has nine portland cement plants in operation, or soon to be placed in operation, and to the uninformed the question is often heard, not in Texas, but in more northern countries in some such form as, "What in the world is Texas going to do with all the cement plants?" The answer: take a trip through other cotton growing states first and then go into the heart of the Texas cotton district, see the miles and miles of cotton fields unobstructed by fences, ravines or trees and brush, extending as far as the eye can reach over the level, what was once prairie land and now healthy, vigorous growths of cotton. Compare the sturdy qualities of these fields with those in the other states and one wonders if nine cement plants will even be a starter in this empire. Sometime this acreage will be turned to land growing more diversified crops, land that can grow a "cash" crop every month of the year, land that re-



Atlas Portland Cement Co.'s new 2200-bbl. per day cement mill at Waco

The Republic Portland Cement Co. has just completed its new mill near San Antonio

quires little or no irrigation, corn land, wheat land, orchard land; name whatever you want and Texas can supply it somewhere within its borders a thousand fold. When these features are appreciated; when the old and vast estates are subdivided further (subdivision of these farms has started and continues as the old owners realize that a farm of 100,000 acres or more is one thing and 10,000 farms with 10,000 homes is another); when these sections and in the cities; that in any of the seven cities in the state that boast of a population of 60,000 or more there are upwards of a dozen construction jobs that were they centered in one city would mark that city as one of the phenomenal cities of our times. Few states can boast of one city that is growing rapidly. Texas can boast of at least seven that are metropolitan in their aspects.

Opening the limestone quarry at the Republic mill

facts are all grouped into the picture then one begins to realize why the eyes of the rock products industries are turned toward Texas.

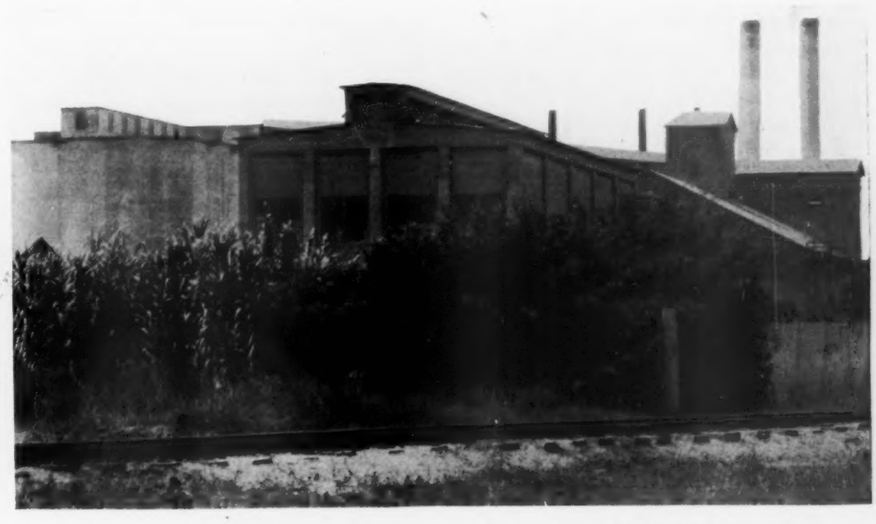
City growths have been rapid and spectacular in Texas, keeping pace with the spectacular oil production which supplied most of the cash for this development. It is inevitable that the growths of cities should follow the agricultural and mineral development when those basic industries have been sufficiently profitable. Take any of the western cities. What would have been the history of San Francisco without the outpouring of gold and silver from the western mines? What would southern California be without its oil production? What will be the future of the cities of Texas with money quickly available from oil resources backed by agricultural areas unsurpassed? Go to Dallas, Forth Worth, Houston or any of the larger cities of Texas and the picture of these beautiful cities with their towering skyscrapers seemingly to have sprung from the level surrounding areas are just hints as to what industrial progress are in store for the whole region.

The writer does not mean to infer that there is a boom on in Texas, but that there is a steady growth, both in the agricultural

Highway work is being pushed as fast as possible, which means as fast as funds are available for this work. Owing to the enormous area of the state, work of this nature must, for the time being, be confined to gravel or crushed stone surfaced roads except in the more thickly settled areas where asphalt roads predominate, although concrete highways are becoming a factor and fast gaining in favor. The roads as a whole are good roads and one does not hear the motorist complain of this district, but on the other hand their expressions are more of one of pleasant surprise that the roads are as good as they are and not like some of the roads in the states immediately to the north of Texas.

Texas, like many other states in the Union, has made use of its gasoline tax, increasing this recently from 3 to 4 c. per gallon. This change became effective during July, 1929. At the same time that the gas tax was increased the automobile license tax was cut in half and there is considerable argument in the local newspapers as to the amount of money that will be available for highway construction for this year and those to follow. Some say that there will be less funds available and some take the opposite view, nevertheless the consensus of opinion is that for 1930 there will be available from the gasoline tax a total of $23,000,000 with an additional income of $2,600,000 from automobile taxes, making a total of $25,600,000. Federal aid allotments are estimated at $4,500,000, making a grand total for highway work of $30,160,000.

In the coastal regions crushed stone for highway or railroad ballast work does not play an important part. Sand and gravel are used practically throughout for work of this nature, with oyster shells being used for railroad ballast on practically all of the rai-

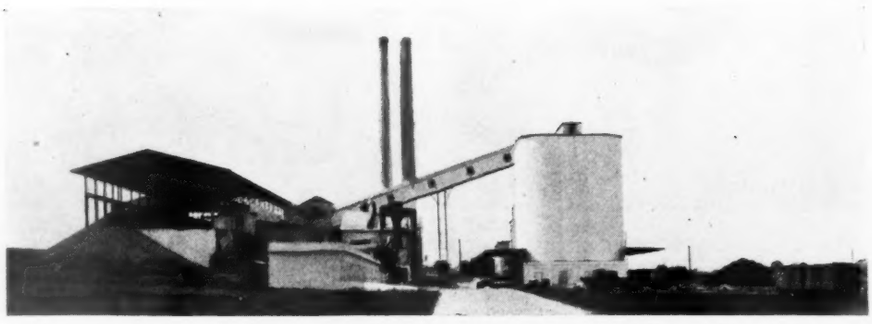


The Lone Star Cement Co. Texas plant at Houston

roads. The Southern Pacific railroad system is reported to be using crushed stone for ballast, but over the railroads traversed on this editorial trip oyster shells or gravel ballast were used exclusively.

Rains in the eastern and mid-western sections of the United States during the spring and summer months caused the rock products operators considerable delays in delivery and Texas was no exception, for practically every day during the spring months showers of varying magnitude were experienced. In the crushed stone industry these rains were very embarrassing, as the screening is done dry and the deposits being mixed with more or less clay-like material were difficult to operate. During normal years it is hard enough to get clean aggregates from irregular deposits, but with the abnormal rains of this year conditions have been very bad.

With conditions to face such as these one might wonder why the operators do not change to the wet methods of screening and washing aggregates, but when this problem was discussed there seemed to be some apprehension as to the possibilities of removing efficiently a clay which, when wet, is very sticky and again several of the quarries are not advantageously located near a plentiful water supply. One operator was considering the advisability of going the opposite direction and installing a dryer to be followed by the usual screening practices. This method of removing clay would, on the surface, appear to be inadvisable, but it must be recalled again that Texas is blessed with a very cheap supply of natural gas for fuel. There is no difficulty in removing the clay from the aggregates during dry periods so the method perhaps has merits worthy of further consideration.



The Fort Worth plant of the Trinity Portland Cement Co.

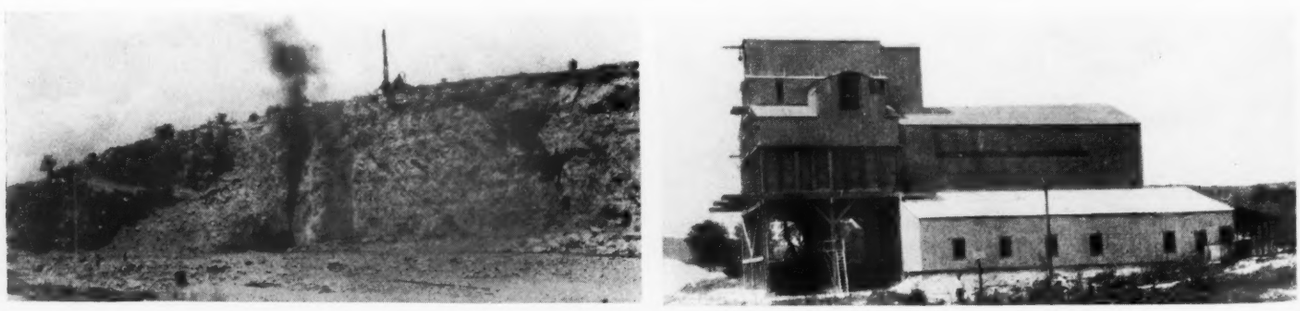
The crushed stone industry in Texas up to within the past few years received many "black eyes" from repeated failures, bankruptcy proceedings, etc., due primarily to inexperienced operators who would build plants that were entirely unsuited for the rock to be handled. This lack of engineering ability, coupled with the great distances that the material would have to be hauled to reach the market centers, led to many failures in operation and it was not until recent years that such operators have either left the field entirely to more experienced men or profiting by their own experience set about to change their operations to a better economic basis.

Landa Rock Products Co.'s crushing plant near New Braunfels

It is easy enough, under present conditions where engineering ability is available on all sides, to build a new and modern, efficiently working plant and to operate it at some profit, but it is not so simple to take an old and entirely unsuitable plant and alter it to compare with the newer ones. The markets are there now, so alterations must be made while the plants are in operation. This is a slow process at best. This condition is typical of practically all of the crushed stone plants in Texas, that of changing and altering their plants, quarry methods and transportation and operating at the same time, so consequently the plants do not have the pleasing appearance to the eye that modern engineering demands. As the industry for the most part is now in the hands of men of unquestionable ability, the next two or three years will see changes in their plants that will put them on a par with the efficient and architecturally pleasing plants that the cement industry boasts of in that state.

Texas has nine cement plants in operation or about to operate, with two others that are being promoted, and there is not much doubt that they will become an accomplished reality. There are rumors of a state owned cement plant to be built. It is regrettable that a state in which portland cement has been one of their pioneers with all the difficulties of a pioneer should even consider trying to compete with industries already established and which are entitled to some reward for their efforts. If the backers of this project would carefully scrutinize the records made by other state-owned cement plants, even in states where the state plant had no internal competition, they would not be so anxious to forward such a movement.

During this year there will have been two new plants starting operation, that of the Atlas Portland Cement Co. at Waco, in op-



Quarry and crushing plant operated by Charles Schoenfield in the San Antonio district. The 125-ft. quarry face is one of the highest in the locality

operation early this summer and the plant of the Republic Portland Cement Co. at San Antonio, which has already gone into production; operation started late in July. With thees two new additions, the Texas portland cement plants are as follows: San Antonio Portland Cement Co., San Antonio; Republic Portland Cement Co., San Antonio; Atlas Portland Cement Co., Waco; Trinity Portland Cement Co., Dallas; Trinity Portland Cement Co., Fort Worth; Trinity Portland Cement Co., Houston; International Cement Corp., Dallas; International Cement Corp., Houston; Southwestern Portland Cement Co., El Paso.

In addition to the new plants many of the older ones have increased their capacities, among which might be mentioned that of the Trinity Portland Cement Co. plant at Fort Worth, where the company has installed an additional kiln as well as new mills for grinding both clinker and raw limestone. By the addition of these units the capacity of the plant has been doubled and incidentally the whole plant is working to capacity. The plant uses the Woodford haulage system for transporting the rock to the primary crusher. The Trinity company operates two other cement mills, one at Dallas and the other at Houston.

All of the plants in Texas, with the exception of the El Paso operation, were visited and found operating to capacity. There was no concern expressed over the additional new plants, the general feeling being that with the state's growth there was plenty of business for all, although when the newer plants were placed in operation the productive capacity would be a trifle greater than the market demand, but not to an alarming extent. The present operators can increase their capacity very easily when the business warrants it so there is no apparent need for any more plants than those already in the field.

Imported Cement

Considerable foreign cement is being shipped into Texas from time to time, although at this time (July) none was being shipped into Galveston or Houston. During the early part of the year several carloads were shipped from the Gulf of Mexico ports to the interior. The small town of Littlefield, about 500 miles from Galveston, was reported to have been the consignee. That cement can be delivered into the interior that distance reflects an unusual condition. Apparently the Belgian shippers have adopted a policy of shipping heavily into a district until public opinion becomes hostile to their interests after which they make shipments to some other place, giving the former a rest until public wrath has quieted down again.

The use of foreign cement in San Antonio caused considerable unfavorable comment and a lawsuit when the district court requested city officials to appear and show cause why Belgian cement should not be used for the construction of a local sewage disposal plant. This suit was at the request of a certain contracting company asking that the city be enjoined from interfering with the company using Belgian cement and to reimburse it for 6000 bbl. reported to have been purchased from Belgian producers. The case, however, was indefinitely postponed and the contractors agreed to use local cement. (See Rock Products, July 20 and August 3 issues.)

New Braunfels Limestone Co.'s plant at New Braunfels

Atlas Portland Cement Co.

The newest plant to be placed in actual operations is that of the Atlas Portland Cement Co., located about 10 miles west of Waco. This began operations during June and is rather unusual among the newest plants in that it uses the dry process. Rock Products will publish soon a complete description of this plant in a later issue.

The Corpus Christi storage yard for oyster shells operated by the Haden Co.

Republic Portland Cement Co.

A second portland cement plant, that of the Republic Portland Cement Co., about 11 miles northwest of San Antonio has been in operation since July 25. It was built by the Smith Brothers, Inc., well known contractors and financiers in the San Antonio district, and this is their newest enterprise and incidentally their first venture into the cement business. The Republic company has separate identity from the Smith Brothers organization and its personnel is made up of experienced cement mill operators. W. M. Thornton is manager.

The plant was designed cooperatively by Richard K. Meade and Co., Baltimore, Md., and the Bartlett Engineering Co., San Antonio, and erected by the contracting company controlled by Smith Brothers, Inc. This plant is built of reinforced concrete and steel throughout and few plants have as massive concrete construction as this plant boasts, with no expense being spared to make it one of the best.

The plant has a two 11x250-ft. Allis-Chalmers kilns and uses the wet process. The electrical features, especially the main control switchboard, are one of many of the outstanding novelties of the plant. A complete description of this plant will also be forthcoming in Rock Products.

Both natural gas and oil are used for fuel. A small part of the warm air from the cooler is used for combustion, the air being taken from the outside atmosphere near the cooler and delivered to the burner by a fan. This practice is similar to the method that the Houston plant of the Trinity Portland Cement Co. is planning to use. The Houston operators are installing a dust collector and will take the hot gases from the rotary cooler and pass them through the dust collector, from whence the hot air will be delivered to the burners. In this way it is hoped that a sufficiently dust-free gas can be obtained and at temperatures which will not cause premature burning at the firing end.

Monolith Portland Cement Co.

This company has its headquarters in Los

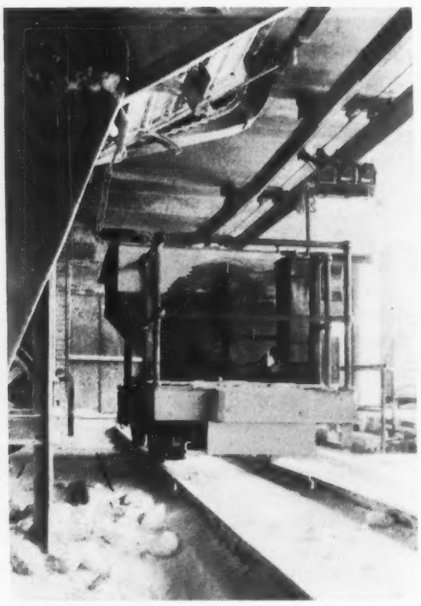
Angeles, Calif., with a plant at Monolith, Calif., and has recently placed a second unit in operation at Laramie, Wyo. It has been considering for some time the erection of a third unit at Aransas Pass, near Corpus Christi, but so far only a warehouse and dock has been constructed and the channel dredged near the site of the plant. Active construction of the plant is expected to start some time this fall. The new mill will have a rated capacity of 6000 bbl. per day, use the wet process and like the other Texas coast cement companies use oyster shells for the source of limestone.

Oyster shells for cement making are used by both the Trinity Portland Cement Co. and the Lone Star Cement Co. at their Houston plants and have presented no particular difficulty except that experience has taught them that grinding of oyster shells was not the simple operation one would suppose it to be, chiefly because of the difference in hardness of the different parts of the shell itself. The main body of the shell tends to flake, while the "hinge" of the shell is very tough and unless this factor is taken into consideration in designing a plant using oyster shells the grinding capacity results are apt to be unsatisfactory.

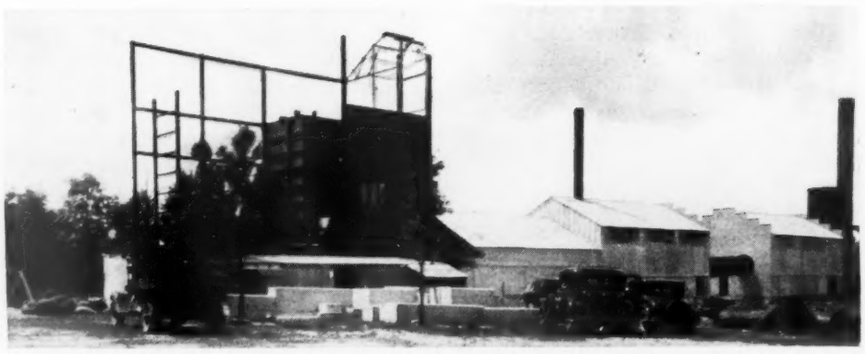
National Portland Cement Co.

This company is still in the promotional stage as far as its cement plant is concerned, but it is building a grinding unit in Houston with the intention of manufacturing a white portland cement from clinker that will be shipped to that port via the Panama Canal. The clinker will be ground at the plant now under construction at Houston.

It is reported that this company has a large deposit of material satisfactory for the production of white portland cement in the Cajon Pass near San Bernardino, Calif., and will erect a calcining plant at that site, shipping the clinker to the various Atlantic and Gulf of Mexico ports, where small grinding and sacking units will be installed. The grinding plant at Houston is reported to have a capacity of 250 bbl. of white portland cement per day. Later the company may establish grinding plants in South American cities, it is said.



Electric car to which lime is loaded from the kilns; this is a part of the mechanization program recently installed at the Dittlinger plant



Lime plant under construction near Houston by the Haden Co. This plant will be the first of its kind—making lime from oyster shells in a rotary kiln

Oyster Shell Plant to Make Lime

About 15 miles from Houston the Haden Co. is constructing what will be when completed the only plant of its kind in the world, producing lime from oyster shells using a rotary kiln for calcination. Brief items about this plant have appeared in Rock Products from time to time and after the plant starts operation this fall, a complete description of this plant and other interesting data pertaining to the burning of lime from oyster shells will be published in Rock Products.

The construction of this plant has been seriously retarded by the heavy rains, especially the placing of the fabricated steel of the hydrating plant. The kiln and cooler are about completed and all that remains is the construction of the hydrating plant and the lime storage bins as well as the conveyor to deliver the shells from dock to the kiln.

The Haden Co. is a large producer of oyster shells in the vicinity of Houston and Galveston, marketing many million tons per year for use in portland cement making, as a highway base material, railroad ballast and for fertilizer purposes. It also is in the building material business in Houston.

The shells are dredged from the many bays and inlets along the coast and are delivered to barges that are in turn towed to the nearest ports for unloading. The plant for unloading shells at Corpus Christi uses a simple clamshell crane and unloads to ground storage or to a bin for local trucking service.

Gypsum

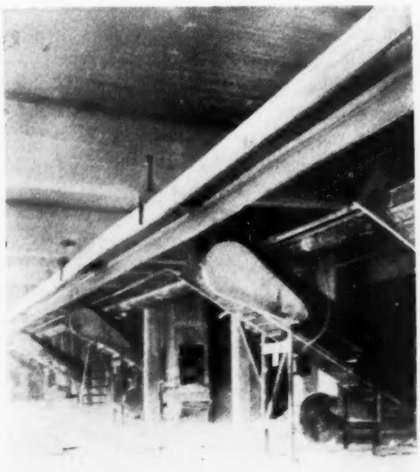
Texas has been in the throes of a plaster war with that material reported to be selling at the mill as low as $2 per ton, but apparently conditions have improved considerable, as gypsum plasters are now being quoted at $5 per ton f.o.b. the mill.

In the vicinity of Houston, the Tidewater Gypsum Co. has opened up, by means of a development shaft, what is claimed to be one of the largest deposits of rock gpsum in the United States. The thickness of the deposit averages in the neighborhood of 135 ft. and covers an extensive area, all of which has been core drilled.

Activities in the New Braunfels District

There are three companies producing crushed limestone within a few miles of New Braunfels; one of these producers also has a large tonnage of burned lime. The lime from this plant is shipped to all the larger cities in Texas as well as into the neighboring states, although crushed stone markets are confined to the immediate vicinity with very little stone being shipped even as far as San Antonio, which is about 90 miles northwest of New Braunfels. Sand and gravel in the vicinity of San Antonio cuts off any large shipments of crushed stone into that city.

This company is the largest producer of crushed stone in the district as well as being



Kiln discharge conveyors at the Dittlinger lime plant

the only lime producer. Quarry operations have been conducted here for upwards of 25 years and during that time the quarry has been expanded until it covers quite a large area.

Dittlinger Lime Co.

Seven shaft kilns are in operation. Recently a series of pan conveyors were installed to completely mechanize the entire drawing and subsequent handling of the burned lime. This equipment consists of one short inclined pan conveyor under each kiln, so arranged that it discharges to an electric car or lorry that travels on an industrial track paralleling the front of the kilns. The car can be spotted in front of a kiln to be drawn and after loading can be transferred to a pair of track scales for weighing. After weighing the car can be dumped to a pit serving another pan elevator that elevates the stone vertically and then horizontally a short distance, where the lime is delivered to a second cross drag conveyor that passes over the cooling bins. When the lime in the cooling bins is sufficiently cold it can be drawn on to another pan conveyor and delivered to car loading equipment or to the hydrating plant.

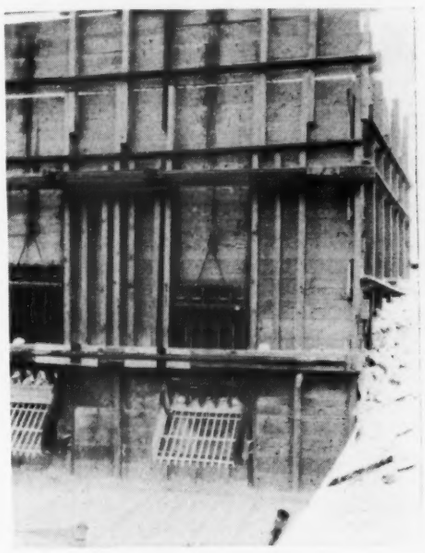
The stone used for burning lime is oversized material from a rotary scalping screen having an end section of 6-in. square opening. This falls to a sorting belt where any unsuitable stone is removed. A belt conveyor delivers the kiln stone to a new storage bin near the kilns, where the stone is drawn into pans that are hoisted to the top of the kilns and dumped by a stiffleg crane.

Six of the kilns use natural draft and the seventh has been equipped with forced draft fans which has increased the capacity of the kiln about 50%, although the condition of the lining and other factors were not known, as the kiln had not been in operation long enough to justify a statement. The kilns all use natural gas for fuel.

The company is building a series of concrete bins for storage of various lime products with the bins so arranged that the sackers will be directly under them.

New Braunfels Limestone Co.

This plant is one of the newest in the district and was built by Max Altgelt. The plant is located about midway between that of the Dittlinger Lime Co. and that of the Landa Rock Products Co. The stone is loaded by a 1½-cu. yd. steam shovel and the cars are delivered to the plant by gravity, where they are pulled up a short incline to the primary crusher. The crusher is of small size and considerable hand sledging has to be done. Screening is by rotaries and like all other plants of the district the stone is not washed.



Kiln stone storage bins at the Dittlinger plant

Landa Rock Products Co.

This company's quarry is in the same ledge from which the other two crushed stone producers secure their stone. There are two steam shovels in the quarry loading stone to Western cars, which are drawn by steam locomotives to the Traylor primary jaw crusher. Gyratory crushers are used for secondary crushing and a series of rotary screens grade the various sizes that the trade demands.

The offices of the company are at the plant. Harry Landa is president; C. Westbrook, vice-president and general manager, and W. P. Hathaway, secretary and treasurer.

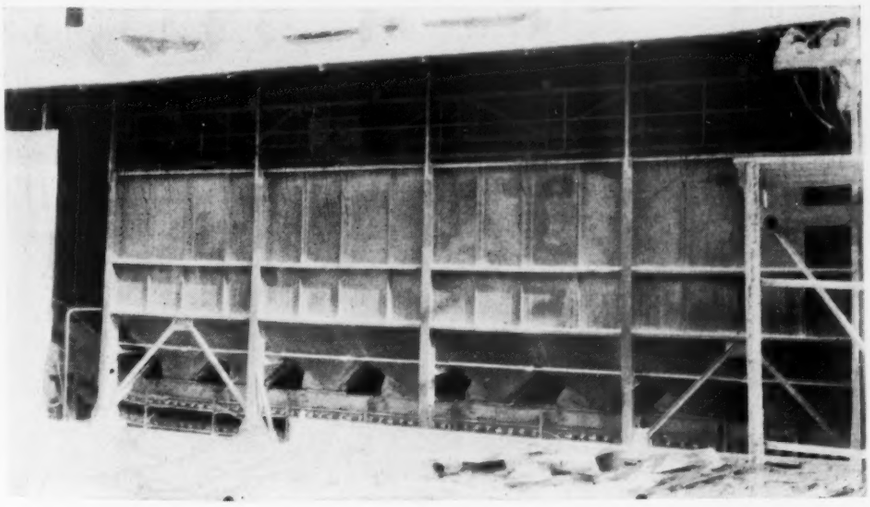
Schoenfield Quarries

In the San Antonio district, Charles Schoenfield has built a crushing plant at his old quarry that was primarily opened up for the production of rip-rap. The new face is one of the highest in this district, being in the neighborhood of 125 ft. high. It is made up of stratas of stone that range from cherty limestone to a quality of stone that resembles Italian terrazzo. While the quarry is highly stratified for the most part, there is no difficulty in securing 25-ton blocks of stone for rip-rap. At present no rip-rap is being shipped and all the operations are concentrated on production of commercial stone and ballast.

The plant originally supplied ballast for the Southern Pacific railroad in southwestern Texas and was moved to its present site by Mr. Schoenfield. Stone is loaded by a single steam shovel and the cars are delivered to the plant and dumped to the gyratory crusher that serves as a primary breaker. Secondary crushing is also done by gyratories with rotary screens used throughout. The plant is unusual in that one can stand near the primary crusher and see practically every screen, elevator and crusher, as no structural members, floors, etc., are in the way to obstruct the vision. The building is of frame throughout. A single 400 hp. induction motor operating through a line shaft and a series of countershafts supplies all the power. W. P. Cashen is superintendent of the company.

Southwest Stone Co.

The operations of the Southwest Stone Co. and the Texas Trap Rock Co., of which W. F. Wise, president of the National Crushed Stone Association, is president, were visited, and extensive changes and improvements were found to be in progress. When these are completed Rock Products expects to give its readers a description of these operations, which will be among the most efficient and interesting in the state.



Steel lime-cooling bins at the Dittlinger plant. The cooled lime is reclaimed by an underneath pan conveyor for shipment to cars or the hydrating unit

A Lime-Plant Engineer

WM. J. KUNTZ, former general manager of the McGann Manufacturing Co., York, Penn., is now in business as a lime-plant engineer and expert under his own name at York, Penn.

"Frictionless" Sand and Gravel Plant

Entire Installation at the Van Camp Sand and Gravel Co.'s New Plant Near Cincinnati, Ohio, Is Anti-Frictionized

By C. C. Milburn
Milburn Construction Co., Columbus, Ohio

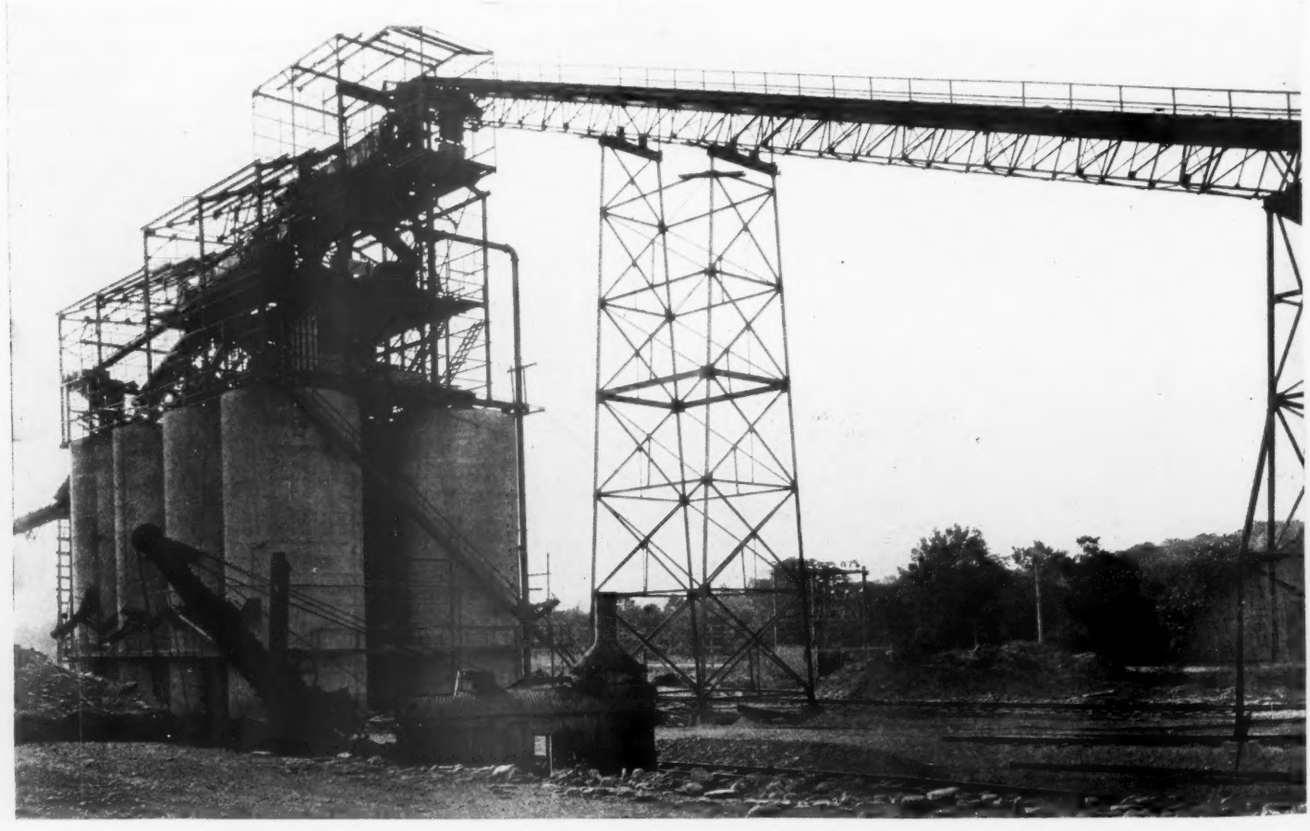
THE new plant of the Van Camp Sand and Gravel Co., near Cincinnati, Ohio, aside from being one of the largest gravel washing plants in the country, is of considerable interest as an example of modern construction and handling methods. The Van Camp company itself is of comparatively recent origin, having been incorporated less than a year ago for the purpose of distributing sand, gravel and crushed stone suitable for all sorts of building operations. It is capitalized at $600,000, the stock being held in Cincinnati and vicinity, where the principal market exists for the company's products. The officers are, B. T. Van Camp, president, John S. Slone, vice-president, and W. L. Ware, secretary and treasurer.

The company's holdings consist of a plot of about 175 acres located on a bench along the Little Miami River, a few miles from Morrow, Ohio, and about 25 miles from Cincinnati. The main line of the Pennsylvania railroad from Columbus to Cincinnati runs along the river side of the plot, offering excellent facilities for rail shipment, and the main state highway is close enough to render shipment by trucks practical. Of the 175 acres, 100 are underlaid with gravel which on test to 40 ft. depths appears to be quite uniform in its deposition. It is quite likely that the gravel extends even deeper, perhaps 90 to 100 ft., judging by other tests made in nearby areas. There is an overburden of from 2 to 3 ft. The material runs from about 25 to 35% of sand, with a comparatively low percentage of foreign matter.

The plant proper was designed and erected by Milburn Machinery Co. of Columbus, Ohio, and the total project represents an investment of about $350,000. As originally planned its capacity was for 300 tons per hour, but in operation it has developed a capacity of about 350 tons. It consists of four buildings, the office, the pump house, located on the bank of the river, a primary crusher house and main machinery building, the latter housing the washing and storage equipment. The buildings are all, with the exception of the office, of structural steel, sheathed in corrugated galvanized iron, and erected on reinforced concrete foundations. The equipment has been selected and installed with two principal factors in mind, simplicity, and operating economy. As a result there are several novel features connected with the plant. Direct drive is used for all equipment; there are no elevators, and the whole installation is anti-frictionized. How these factors have been combined in practice can best be seen from a description of the operating procedure in force.

Raw Material Handling Equipment

Material is excavated from the pit by a 2 cu. yd. Marion steam shovel, which loads directly into standard gage, side, air-dump cars of 30-ton capacity. These cars are hauled to an open concrete hopper of 100-



General view of the Van Camp Sand and Gravel Co.'s new plant near Cincinnati, Ohio

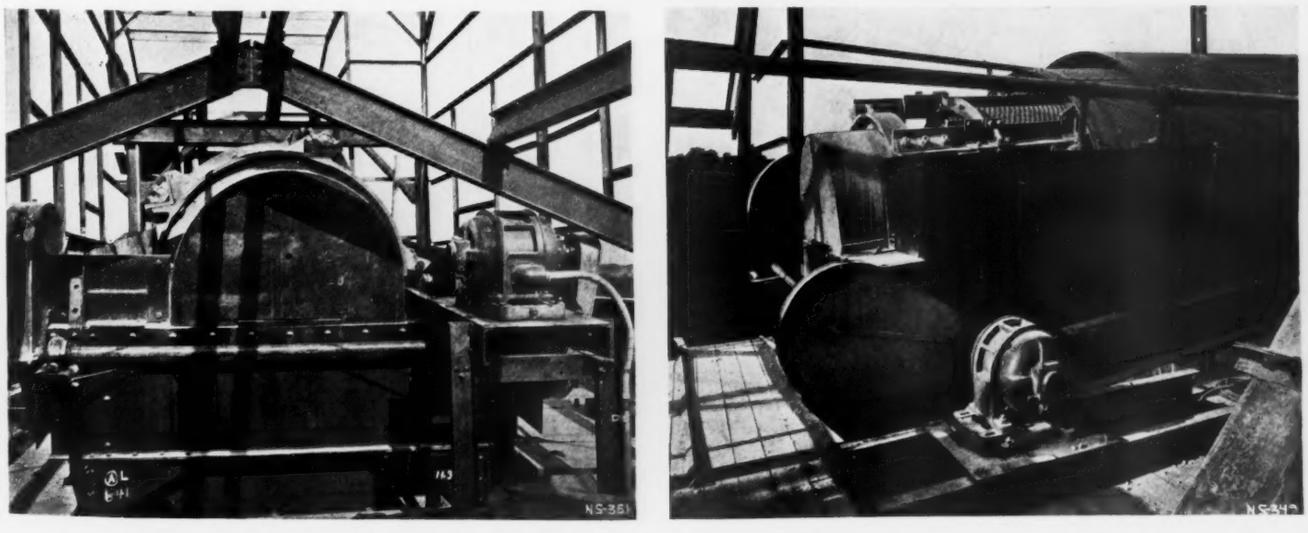
Concrete track hopper to which excavated material is dumped. The belt conveyor carries material to the primary screening and crushing plant

ton capacity by a steam locomotive, and dumped from the track. The average load consists of from 23- to 24-cu. yd. of material. From the hopper bin the material is fed to a 36-in. conveyor by two Smith Engineering, Timken-equipped reciprocating feeders, each driven by a General Electric 5-hp. squirrel cage induction motor, with friction release clutches. The feeders are located in a reinforced concrete pit underneath the hopper. The control for the motors, as well as that for the conveyor drive motor, is located in the machinery building, so that the supply of raw material can be regulated according to conditions in the rest of the plant. The control is also automatically interlocked, so that the conveyor motor starts before the feeder motors, and the latter shut down ahead of the conveyor motor. In case of outage on one feeder, the stroke of the other can be lengthened, and 2/3 normal capacity can be obtained from it. This arrangement is also used during periods when the plant is running light.

Primary Crushing

The conveyor to which material is fed is a 36-in. belt, 160 ft. on centers, and driven by a General Electric 30-hp. squirrel cage induction motor at a speed of 300 r.p.m. It delivers material through a 17-deg. angle of rise to the primary crusher house. Material from the conveyor passes over a sloping bar grizzly, made of 85 lb. rails spaced on 3-in. centers. The through, 3-in. and under fall into a chute that delivers directly to a main 300 ft. long belt conveyor for delivery to the finishing building. Oversize material passes over the grizzly to the hopper of a Telsmith primary gyratory, which crushes it to 3-in. and under. This crusher is driven through a Texrope drive by a General Electric 40-hp. slip ring motor, and is equipped with Timken bearings on the countershaft. The crusher is inserted at this

Secondary crushers, a gyratory and a cone, both have short-center rope drives



Left—Drive end of the 72-in. scalping screen and, right, the 60-in. double jacketed gravel screen. Both screens are completely equipped with anti-friction bearings

Another view showing the 300-ft. belt conveyor carrying material from the primary crushers to the scalpers

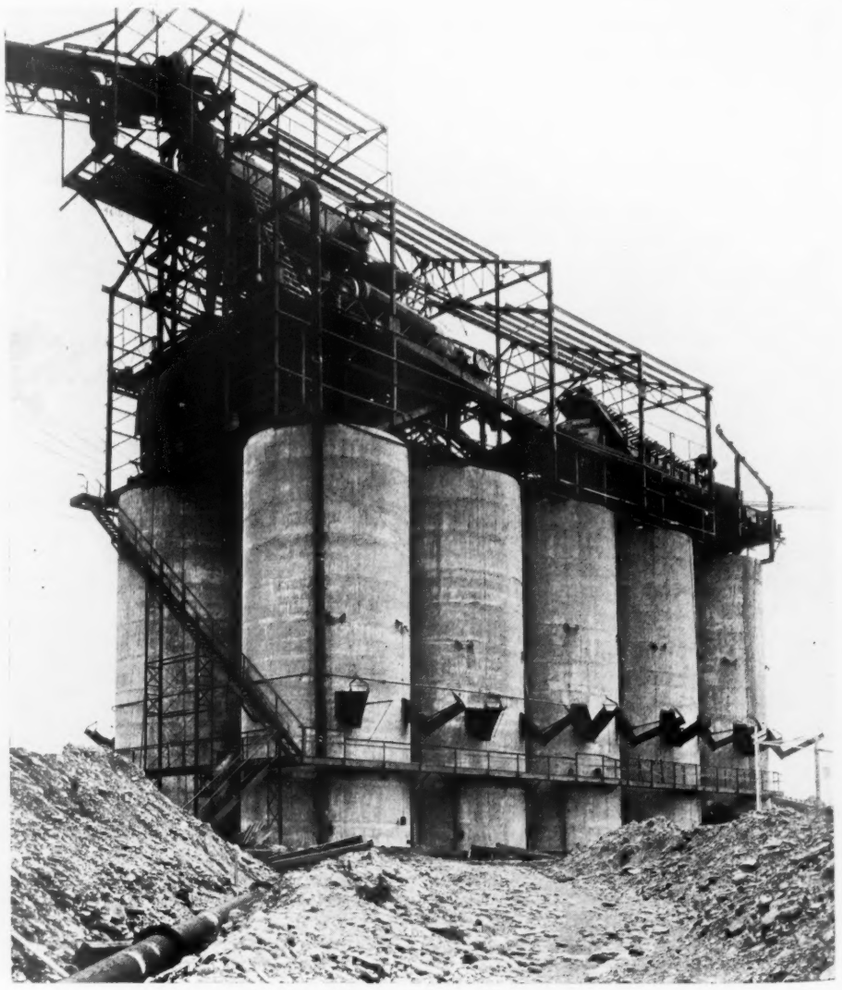
point to lighten the load on the main crushers located in the finishing building. From the crusher the material drops on to the main delivery conveyor, a Link-Belt Timken-equipped 36-in. belt, 300 ft. on centers, with a 19-deg. slope. The conveyor carriage is supported by structural steel piers, mounted on concrete pediments. A General Electric 50-hp. squirrel cage induction motor operates the belt at a speed of 300 f.p.m. The belt delivers material direct to a Telsmith Timken-equipped 72 in. by 24 ft. rotary scalping screen located at the highest level of the machine building.

Pump House

Before continuing with a description of the passage of the material through the washing plant, it may be of interest to consider the provision made for supplying the plant with water. The pump house is located on the bank of the river, about 475 ft. from the plant, and houses two 10-in. Weinman anti-friction bearing centrifugal pumps, individually driven by a General Electric 125-hp. direct-connected squirrel cage motor. The pumps are located in a pit on the river bank, four feet above mean water level, and 15 feet beow high water level. The walls of the pit are of reinforced concrete 24-in. thick at the bottom and 18-in. at the top. Each pump has a capacity of 3000 g.p.m., against a 115 ft. static head. Both are connected to a common 14-in. line that runs directly to the washers in the machine building. Only one pump is used at a time, the other being held as a spare. The intake line consists of a 10-in. suction pipe, extending through the outer pit wall for 20 ft., where it is connected at a 90-deg angle to a 12-in. pipe extending below mean water level. The end of this pipe is equipped with a specially designed trash rack, consisting of a basket shaped arrangement of heavy iron strips fastened to a flange at the end of the pipe. The 14-in. pipes to the plant have been buried so deeply that auxiliary priming is never necessary, the pumps being primed from the line. The motors are controlled from the machine building.

Washing and Sizing

The washing plant, which is mounted on the storage silos as foundation, has three levels; on the top one is mounted the scalping screen, on the next the gravel washer stone screen and sand drags, and on the lowest the crushers and control room. The passage of the material through the building is practically entirely by gravity, there being a minimum of handling equipment, and no elevators. The conveyor from the primary crusher house delivers it directly to the Tel-Smith rotary scalping screen, as already described. This screen is 72 in. dia. by 25 ft. long, the jacket having 2½ in. perforations, and is of a new type developed by the Smith Engineering Works of Milwaukee. It is driven by a General Electric 20-hp. squirrel cage induction motor, and the shafts and trunnions are equipped with Timken bearings. Throughs of the screen go to a Telsmith Timken-equipped double-jacketed gravel screen, while the oversize is carried by a steel chute to the hopper of a Telsmith No. 52 Timken-equipped reduction crusher, or to that of a Symons cone crusher. Both crushers are driven by Texrope drives, the former by a 75-hp. and the latter by a 60-hp. General Electric slip ring induction motor. The crushed gravel as discharged by the crushers passes to a 30-in. Stearns Timken-equipped



Washing plant atop of the storage bins

belt conveyor, driven by a 10-hp. General Electric squirrel cage motor, which carries it to a Telsmith Timken-equipped stone screen.

The two screens are mounted together on the middle level. The gravel screen is a 60-in. dia. by 25 ft. screen of a new design, direct driven by a 15-hp. General Electric squirrel cage induction motor. Both the driving and gear shafts and the trunnion rollers are equipped with Timken bearings. Water is furnished to the gravel screen at the rate of 1400 g.p.m. for washing purposes. The washed and sized gravel is delivered to the proper storage silo by steel chutes and the waste water passes through the sand jacket and, together with the sand and silt, is delivered to two Jeffrey 42 in. sand drags where the coarse sand separation is made. These drags are each driven by 5-hp. motors. From here the effluent goes to three No. 8 Telsmith fine sand tanks, where the brick sand is recovered. The waste water and silt is then carried to a point about 700 ft. from the plant by a flume and discharged.

The procedure in the case of the stone screen is very similar. Material is delivered from the crushers by a series of two Stearns Timken-equipped belt conveyors individually driven by 10-hp. General Electric squirrel cage induction motors. The first conveyor, 60 ft. on centers, raises the material from the crusher level to a point nearly on a level with the screens, where it is delivered to the second by means of a steel chute. The second, 80 ft. on centers delivers the material directly to the screen. By virtue of this arrangement it has been possible to dispense with elevators. The screen is a double-jacketed Telsmith, 60 dia. by 24 ft., Timken-bearing equipped screen similar to the gravel screen driven by a 15-hp. General Electric squirrel cage motor. It is supplied with water for washing the stone at the rate of 1000 g.p.m. Crushed material, after being washed and sized in the screen is delivered to the proper storage silos by steel chutes. The waste wash water carries the stone dust and silt from the outer jacket of the screen to a Telsmith No. 7 converging tank, where the bottom discharge is diverted and stored as ¼-in. to ⅛-in. stone chips, or else is allowed to mix with the finer stone dust, and flumed into the ⅞-in. washed stone storage for road binder. The waste water is carried away by the waste water flume.

The control for all motor drives in the plant is centralized at one point, a control room located on the crusher floor of the machine building. In addition, different machines are all equipped with emergency "stop" push button stations located at points convenient to operators. The whole plant represents a total connected load of 485-Kw, all the electrical motor and control equipment being supplied by the General Electric Co. Power comes in at 33,000-v. to a transformer substation near the machine building, where it is stepped down to 440-v., 3 phase, 60 cycle working voltage by a bank of three General Electric 300 k.v.a. 33,000/440-v., single phase, 60 cycle power transformers.

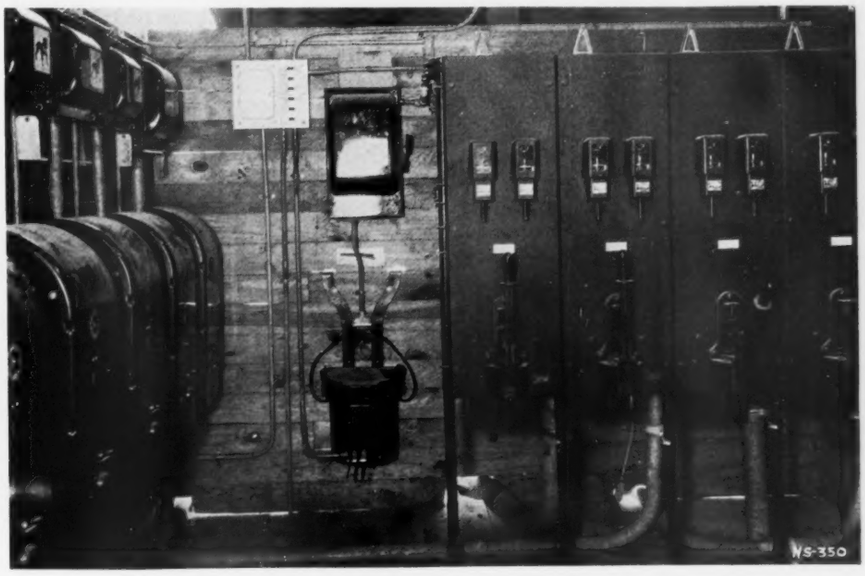
The drag classifiers for coarse sand separation

Storage

There are nine storage silos altogether, four being for crushed rock which are located on the side under the stone screen. The other five silos under the gravel screen are used for storing gravel. Each silo is 50 ft. high, and has an inside diameter of 20 ft., the walls being 8 in. thick. They have a total capacity of 6750 tons, or 750 tons each. Provision has been made for mixing firavel to any percentage with the crushed stone in any silo by means of a system of movable steel chutes. The silos are provided with two delivery chutes, the one on the outside for loading railroad cars, and that on the inside for loading trucks. The plant has been provided with an extensive trackage system, comprising two miles of track altogether, giving facilities for loading 80 cars per day. Car loads are weighed out over a track scale, and trucks on a truck scale located in the plant office.

Rolled Slag and Traffic Bound Roads

SYMPOSIUM No. 15 of the above title has been recently released by the National Slag Association, Cleveland, Ohio. It treats generally the use of slag in those roads which are constructed principally by rolling the material into place, with no addition of cementing materials other than water. The various types considered are: Waterbound macadam surfaces; waterbound macadam as base for new construction; slag-clay macadam roads; waterbound macadam bases; traffice-bound roads; airport runways; granulated slag roads; rolled slag base under brick and block; rolled slag sub-base; slag fill; slag cushion or bedding course.



Controls for the entire operation are located in a room at the washing plant

Looking into the pit; the upper stratum is a sandy loam overlaying the clay and under this is the silica sand bed

Splicing a cable in the pit. Note the scraper bucket in the foreground; this is used to bring in the sand to the plant

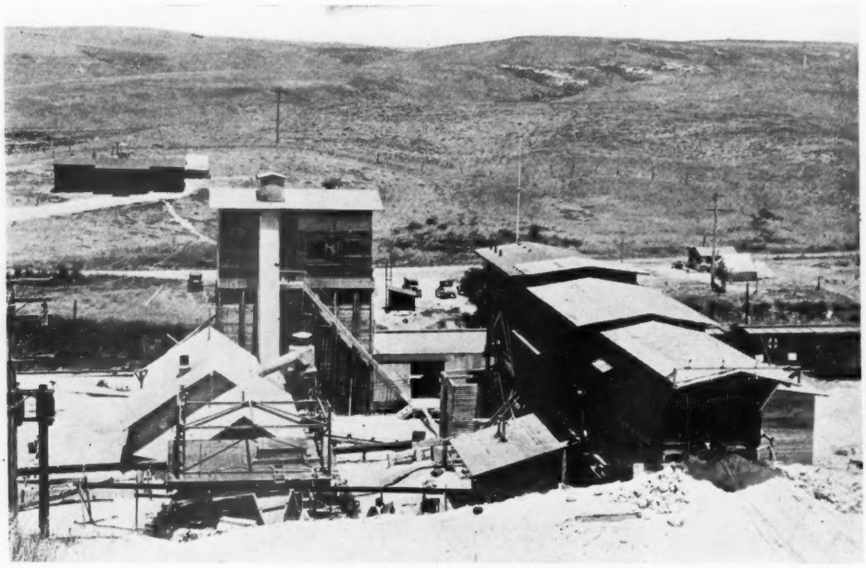
Preparation of Silica Sands in California

Crystal Silica Sand Co., Oceanside, by Efficient Processing Makes Many Marketable Sizes—Strippings Sold for Ceramic Uses

CALIFORNIA HAS NEVER been an important silica sand producer and much of its requirement has been supplied from other countries, notably from Belgium. There are no deposits in the state comparable with those of certain middle west and Atlantic coast states where enormous deposits of high grade material are found with conditions that make the quarrying and preparation for the market comparatively easy. Yet there is a splendid market for silica sand, not only in the 14 glass factories of the state but in the tile and pottery factories and for use in plaster stucco and as filter and blast sands. Some of the earlier attempts to supply this market from local sources were complete failures because the practice brought from other parts of the country was not suited to local conditions; also, perhaps, because there was a prejudice against local material. All these reasons make the success of the Crystal Silica Sand Co. of Oceanside, Calif., which began production in November, 1928, one of the outstanding successes of the rock products industry in recent years.

One reason, and perhaps the main reason, for this success is that J. A. Benell, the manager of the company and its organizer, is an industrial engineer with a wide experience in other lines of industry. He could look at the difficulties from a different viewpoint than that of the ordinary producer. There were conditions that might have frightened off a man who knew only the silica sand business, such as the limited amount of water in sight, the heavy clay overburden and the competition from foreign sand. But the meeting and overcoming of such difficulties in other industries had been Mr. Bennell's job for years and he knew how to find a way around when there was no chance to go straight through. He was so successful at this that some things that appeared at first to be liabilities are now rated as assets.

The deposit is in the rolling hills near this part of the California coast, about four miles east of Oceanside. White sand outcrops on some of the hillsides and it can be seen in the bottom of cuts on the road from Oceanside to the plant. But drillings over a large part of this area have shown that for one reason or another much of the sand in it is not workable commercially. After prospecting the company selected 100 acres as containing the most valuable deposits. The vailable tonnage is estimated at 15,000,000 tons.



The processing plant as seen from above the pit. Washing unit shows at the right and the dryer at the left

The sand stratum follows the contour of the hills more or

The sandy loam topsoil is removed by a tractor and a wheeled scraper

less and the clay overburden is a capping on the higher parts. The theory has been suggested that the deposit was laid down in a broad synclinal trough and after being covered with clay was folded somewhat, the present valleys being formed by later erosion.

Removing Overburden

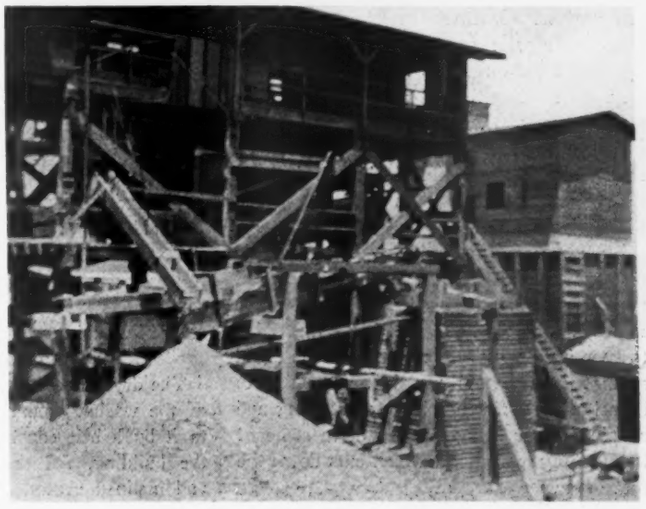
The clay overburden is locally called bentonite because it has practically the same chemical analysis as bentonite, although it does not equal it in absorbent power. However, it is a valuable ceramic raw material and the market for it is sufficient to take all that is produced in stripping. There is a possibility, in fact, that this clay may be the basis of a new ceramic industry some day and its present sales are sufficient to cover the cost of stripping. It has a variety of uses in the brick, tile and stoneware industries.

On top of the clay is a sandy loam about 2 ft. deep which is removed by a tractor and wheeled scraper. A large area was being uncovered just beyond the present pit when the plant was visited and the dirt was being placed by the tractor to make a new water reservoir at the foot of the hill. This will be needed shortly to hold the water from new wells.

As everyone familiar with the country knows, the assurance of a sufficient water supply is the first consideration in planning almost any kind of an industrial operation in southern California. The water situation for this company would not have appealed to the Atlantic coast producer, accustomed to draw on rivers for a practically unlimited supply, for the only water in sight was in wells situated some distance from the plant. However, the company's holdings took in proved water bearing land and it was judged that by using the water economically the supply would be sufficient not only for present needs but for the enlargements that would be sure to follow a successful operation. And this has worked out as planned.

Both the clay overburden and the sand itself are worked in a simple manner, as neither is much consolidated. The ground is drilled with an ordinary auger and the holes are lightly loaded with Trojan granular powder, which has the same effect as black powder without being so bulky. The sand is brought into the plant by a scraper bucket of the "arrow-head" type, which is pulled in and out by a two-drum hoist made by the Western Hoist and Machinery Co. of Los Angeles. The working face of the sand is about 30 ft. high at the present time.

The scraper bucket discharges on a grizzly with 4-in. spacing, which is necessary to take out an occasional cemented lump. These lumps do not constitute much of a loss, as the small pile that has accumulated since work began shows. After passing the grizzly into a hopper and over an automatic plate feeder, the material goes on an inclined conveyor that lifts it to a Stephens-Adamson Gilbert screen, 60 in. in diameter, which has ¼-in. perforations. Water is added here. The undersize is split between two chutes that go to two flight conveyor washing drags, one on either side of the building, for below the screen all the plant units are in duplicate. The drags are made of a 6-in. belt on which 12-in. wooden flights are fastened and the ends of the flights are cut off diagonally so that the material will tend to flow back on the belt. The purpose of this is to keep a considerable amount of material in agitation all the time and so to scrub and wash it. The oversize of the Gilbert screen is sent to waste. It amounts to about ½ of 1% of the feed.

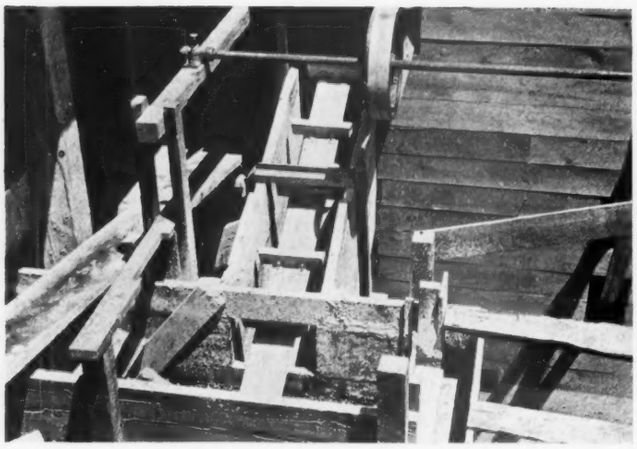


Side view of plant showing the small drag and the drainage bins

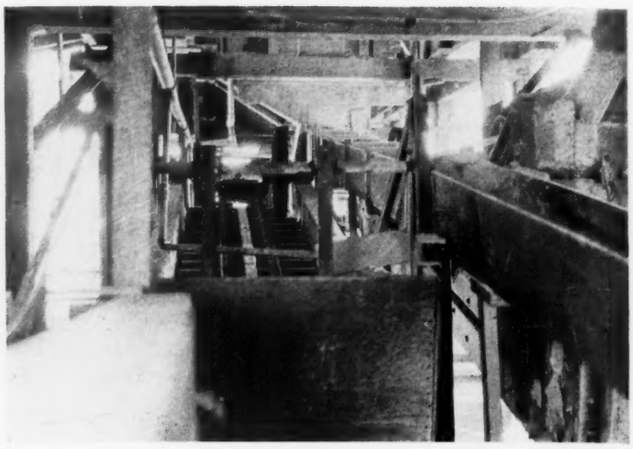
Crushing

The overflow from the drags contains nothing but clayey material and flows by gravity to the water recovery ponds. The washed material drawn out by the drags is washed through chutes to two pebble mills in the basement of the plant, and as these mills are rather unusual in silica sand plants they are worth a word or two of detail. They are 8 ft. in diameter, outside, and only

The pit material is washed in the dark building at the right



One of the drags for washing the screen undersize



Rake classifiers used for washing the pebble mills product

5 ft. long, for their purpose is not to crush the grains but to separate them from their surface coating. The lining is of Belgian silex blocks and the grinding medium Danish pebbles. The important parts of the grinding process are the regulation of the spout and the quantity of water which goes with the sand to the mills, as the cleanliness and fineness of the product depends as much on water regulation as on anything. As the lining blocks are 4 in. thick, the interior dimensions are 8 in. less each way than those given above.

Each mill is driven by a 40 hp. electric motor of General Electric make, as are all the other motors in the plant. It takes the full 40 hp. to start the mill but only 25 hp. to keep it running. The drives are arranged so that these motors are always working to capacity, the difference between starting and running power being used to drive some of the washing machinery, which cuts down the cost of power.

Washing and Classifying

The product of the mills goes to two sets of rake classifiers (although their purpose in this plant is to wash rather than classify). The bank of rakes in these classifiers is 18 ft. long and 24 in. wide set at a 15 deg. angle. The back throw of the motion is rigid to insure a thorough washing of the sand on both strokes. The overflow goes to the ponds and the sand goes to two more classifiers of the same size and type but run eight strokes per minute slower. The difference in speed has been found important in securing a clean sand. From these the sand goes to two Stephens-Adamson rake classifiers, where it receives its final rinsing and then it goes to the drainage bins.

All the sand which is coarser than 80-mesh goes to the drainage bins. The overflows of the classifiers go directly to the ponds except the overflow from the last classifiers in the series, which has a somewhat smaller settling area than the others. This is sent to a drag on the outside of the building that takes out any plus 80-mesh sand and sends it to the bins. There is still the minus 80-mesh sand in the overflow, but this is practically all recovered by a drag with a very large settling area situated near the ponds. There is hardly anything but colloidal material carried by the water into the first pond, the large settling area and the very slow speed of the drag recovering almost everything of a sandy nature.

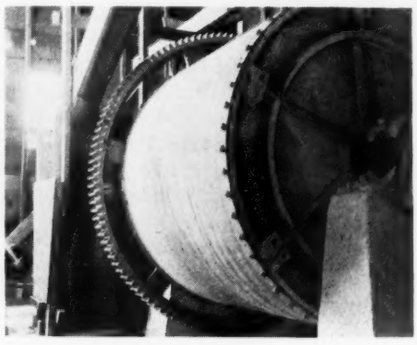
It takes about three hours for the sand to drain in the drainage bins, the moisture being reduced from 22% to 8% in that time. The sides of the bins are of slats, allowing the water to escape by side filtration, and it appears to flow out about as fast as the sand brings it in. As the sand is very clean, only film moisture, and a little retained by capillarity, remains with it.

The dryer house is about 50 ft. to the side of the washing plant and the sand is taken to it by a belt conveyor which runs across the building, fed through the usual gates and inclined chutes. The belt rises enough to discharge into the hopper from which the dryer is fed.

Cyclone on the fan exhaust

Drying

The dryers are of the indirect type and were designed and built for the plant. Oil is the fuel used and it is burned in a cylinder like a boiler shell with ample combustion space. The hot gases pass from this through



One of the two pebble mills

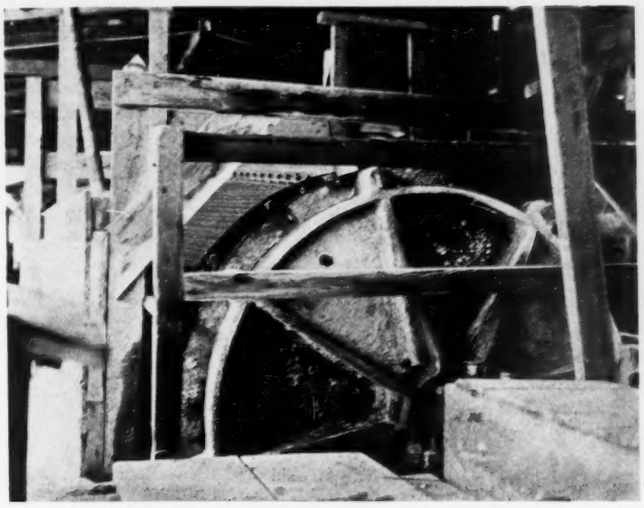
a tube in the center of the dryer proper, connection being made through a seal ring like those used on rotary kilns. The sand is fed into a cylinder which surrounds the hot tube and is sent forward by a system of flights which was originated at this plant. Tests made on this dryer show it to have 68% thermal efficiency, and while this appears low as compared with the 80% obtained with direct heat dryers working on sand, it is considerably better than some other dryers of the indirect type can show. Indirect drying is necessary because the plant product is sold for many uses for which it would not do if it were soiled or colored.

There is no stack on the dryer house, all the draft being given by fans. There are two of these, an induction fan with a 7 hp. motor and an eduction fan with a 10 hp. motor. These motors and the motor which turns the dryer are all of the variable speed type so that the rate of drying may be controlled. The effect of the draft fans is theoretically the same as that of a stack 162 ft. high. It costs something to run the

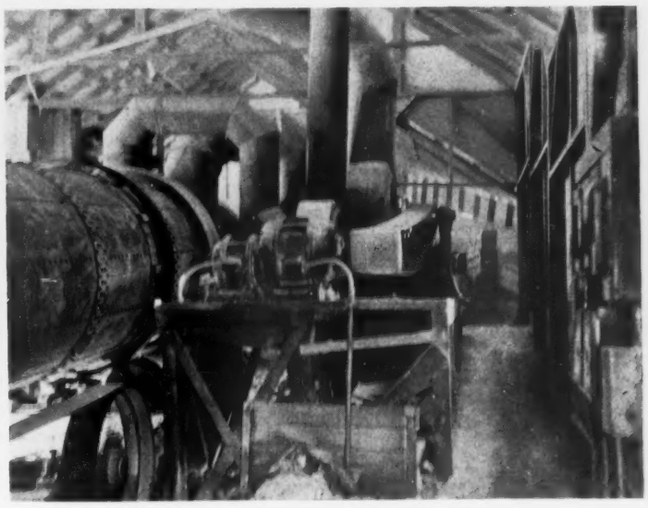
fans, but there is a great saving in construction costs and the regulation of the drying is better than it would be with a stack. A cyclone, 5 ft. in diameter, collects the fine sand that is pulled out by the draft.

Dry Screening

From the dryer the sand is lifted by an enclosed elevator while it is still hot to the screening plant located in a room over the shipping bins. There are two vibrating screens in this plant, a Cottrell double deck and an Isbell double deck, the latter just installed at the time of the writer's visit. The mesh sizes are varied according to the product wanted and several more products are made than are usually made at silica sand plants, as will be explained later. The screen products are all sent to the shipping bins to be loaded into railway cars. Carload shipments are made by rail over the branch of the Santa Fe on which the plant stands and smaller lots move by truck to points inland and on the south coast.



Primary washing screen and housing



The dryer with draft fans and motors

Unusual Water Recovery System

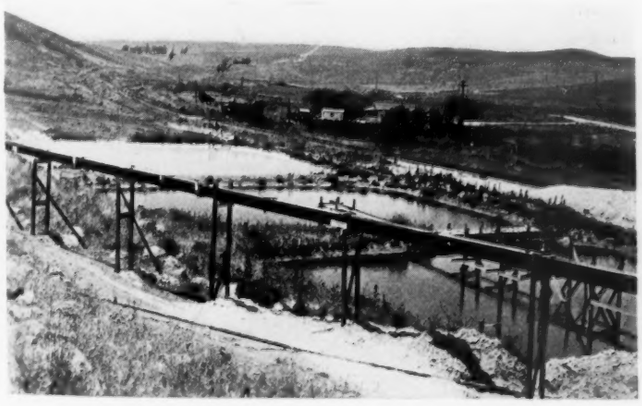
The water recovery system is one of the most interesting features of this plant and it is so successful that over 60% of the water is recovered, the main loss being by solar evaporation, which is very high in this climate. The system consists of three ponds which occupy a roughly triangular area at the west of the plant. The largest, the farthest away from the plant, receives the overflow of the large drag, mentioned above, that stands on the edge of the pond. The water in this pond is always colored with clay. The overflow from it goes into the middle pond, where it is further clarified by settling; in fact, the water in this pond appears so clear to the eye that it seems ready to go back to the plant. But it is passed to the third pond through a filter made of washed sand so that it is crystal clear in the third pond. The new water, an insignificant looking stream compared with the volume circulating through the plant, is pumped from the wells into this third pond. With this system there is no chance for contaminated water to be returned to the plant, as sometimes happens where sedimentation alone is relied upon for clarification.

The clay that settles in the first pond is a valuable ceramic raw material and is dug out occasionally by a tractor and scraper and sold to tile and pottery works.

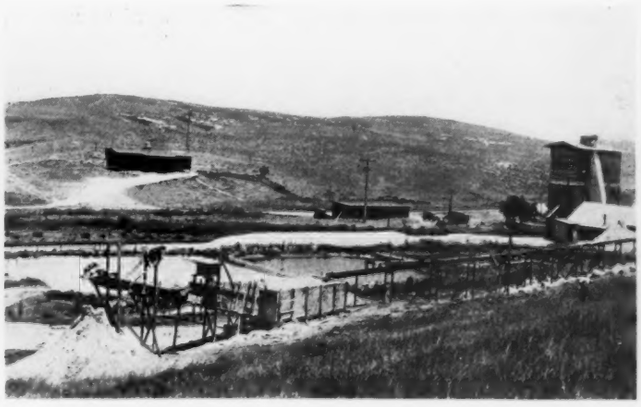
Compact Design a Feature

This plant is one of the most interesting that has been designed for preparing silica sand for the market. It does not at all resemble the ordinary plant in outward appearance, and it looks very small to contain so much machinery. But this is because it is a model of compactness, and the building corresponds to one of the modern principles of plant design, which is that the building should be no larger than is necessary to contain the machinery. There is room for a man to get anywhere that he will be needed and for making all necessary repairs, but there is no waste space. The fact that it is a two-unit plant allows repairs to be made on one side while the other is running, so that there is only a minimum of lost time.

Before designing it a trip was made to the silica sand producing sections of other states to study methods and conditions. Small scale experiments were used to confirm the deductions made from a study of the indus-



Clarifying ponds; the clayey water goes to the farthest and its overflow is filtered between the second and third pond



Tailings, flume and drag for removing minus 80-mesh sand from the settling area near the ponds

try and then the plant was built. It is classified as a motivated gravity plant, the flow through being by gravity but accelerated by motorization where required. All machines have remote control and this feature is one that is found in very few plants of any kind west of the Mississippi.

The finished product runs about 96% silica, the remainder being almost wholly feldspar, which does not injure it for ceramic purposes. The small iron content, less than 0.05%, is combined in such a way that it cannot be removed by washing, but a considerable part of it is sent by screening into those products in whicl it is not objectionable. The sand will make all ordinary kinds of glass, including "Dutch" flint, and is sold in considerable quantity to glass factories. However, the glass industry provides only part of the market. Some of the uses to which the various sizes are put are:

Eight- to 16-mesh, sold to an insulating company for making mineral wool, and used as aggregate for "gunite" and waterproofing concrete; 10- to 16-mesh, coarse blast sand and filter sand; 16- to 60-mesh, glass sand, dash coat for stucco, molding sand, finer filter sand and fine blast sand; 30- to 80-mesh, traction sand, used by railway and street car companies; interior finish and fine blast sand; minus 80-mesh, ceramic sand, Caen stone finish, stucco filler and art stone sand.

An office and warehouse is maintained at 716 East 60th street near Central avenue, Los Angeles, and many sales of small lots for playground sand, plastering sand and many industrial uses are made there. Small lots are also sold for making waterproofing for wainscoting and floors and for acid proofing. The ceramic sand is an especially wanted product and shipments are made to mosaic tile factories in Phoenix and El Paso.

Belgian sand at present sells for $5.80 a ton in Los Angeles, all charges paid. Eastern sands of the best grade sell for $11 a ton. So there is a comfortable margin for a local plant to work on. The demand is greater than the present plant can supply and expansion plans are now in progress.

Laboratory research is carried on constantly to develop standards for a variety of trade demands. Physical and chemical tests are a part of the daily routine.

The company is a California corporation, made up of well known residents of Los Angeles. J. A. Benell is president and general manager; J. H. Bonnell is vice-president and treasurer, and W. B. Harper is secretary and sales manager. The directors are T. V. Allen, T. B. Hatten and O. A. Topham.

Economics of Gypsum Industry

R. M. SANTMYERS, mineral specialist, United States Bureau of Mines, Department of Commerce, has completed a field trip in the course of which he visited gypsum deposits and plants in the New England States and the Maritime Provinces of Canada, for the purpose of obtaining information relative to the producing and distributing facilities of the gypsum industry. The information gathered is to be used in an economic study of the gypsum industry of the United States, Canada, and Mexico.

An interesting feature of the industry in Nova Scotia is the loading of the ships. The rise and fall of the tide, especially in the vicinity of the Minas Basin, reaches more than 40 feet, necessitating the use of flat bottomed vessels and specially built cribbing, as the ships are frequently high and dry at low tide.

Undesirable Conditions Affecting Construction Price Levels

THE report of the special committee appointed by the Texas branch of the Associated General Contractors to make a detailed analysis of the various factors entering into the price level of construction work in the state of Texas revealed a highly important factor. The analysis of bidding lists on competitive work showed an average difference of 3½% between the lowest bid and the second low bid during the years 1926-7-8. It also showed that the net profit of those who made a profit and so were willing to report such for 1926 averaged 6.61%, for 1927 averaged 5% and for 1928 averaged 4.71%.

Summarizing, the points developed by the analysis of the current price level for construction work clearly indicate that present low profits are the natural result of fear, bad business methods and lack of organized effort for practical reform.

A recapitulation of the report, showing causes and possible cures, is as follows:

Cause 1. Over-expansion of capacity for performing construction work—too many firms scrambling for available contracts.

Cure—Intelligently increasing the margin of profit to a point where each contractor can make a normal profit on normal volume and developing economic means of weeding out irresponsible operators.

Cause 2. Selling our service under a system of open competition where price is the only factor for determining the award of the contract.

Cure—A well organized campaign of national, regional and local publicity designed to educate the general public away from blind worship of the low bid, proper selection of bidders and proper understanding of how to buy construction on quality and service as well as price.

Cause 3. Complete demoralization of the subcontracting and material market through the practice of shopping and peddling.

Cure—Courage on the part of general contractors to refrain from shopping and peddling, and cooperative work with subcontractors and material dealers in establishing the slogan, "My first price is my best and last price."

Cause 4. Lack of uniform credit practice in sale of equipment and material and machinery for interchange of credit information.

Cure—Complete, as rapidly as possible, the work which has been under way for the last three months for establishing standard, uniform credit terms for the sale of each class of construction material; set up a central credit bureau for interchange of credit information between dealers in construction material, and lend whole-hearted cooperation of this association for enforcement of the entire credit plan.

Cause 5. Lack of sound business methods among contractors, particularly as to selling, accounting and management.

Cure—A well organized and continuous campaign of education among our own membership for the purpose of demonstrating the necessity of accurate and adequate cost accounting, estimating, bookkeeping and equipment control; cooperative development of better selling practice and business management.

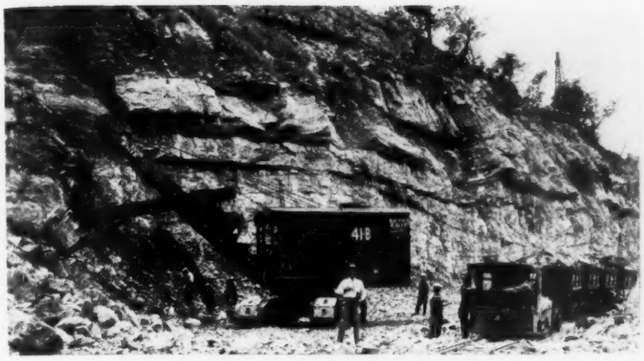
Cause 6. Unnecessary low bidding caused by fear of losing a job or fear of what competitors may bid.

Cure—Realization that statistics show the lowest bidder in Texas during 1926, 1927 and 1928 to be, on the average, 3.5% lower than the second lowest bid; realization that the chances for securing a job in competition are not materially lessened by bidding intelligently and for a profit; courage to bid according to known costs instead of trying to bid "against" a competitor; refusal to be scared into bidding low by the fear-complex that seems to have overtaken the industry, and, above all, to realize that profits only come to the contractor who has courage to demand them.—*The Constructor.*

Rotary Kiln Uses

IN A RECENT issue of *Industrial and Engineering Chemistry,* W. S. Dickie outlines the development of the rotary kiln with special emphasis on its use in industries other than the cement industry. Its use has been extended to lime burning, gypsum calcining, nodulizing blast furnace dusts in metallurgical work as well as to desulphurize copper sulphate ores. The aluminum industry and the paint manufacturers have recognized the rotary kiln's value; the latter especially in the manufacture of lithopone.

The author of the paper, also outlines its use in the recovery of soda ash, reburning of paper mill lime sludges, dehydration of Fuller's earth, de-tinning of old cans, smelting of ores of mercury, preparation of granules and continuous production of coke.

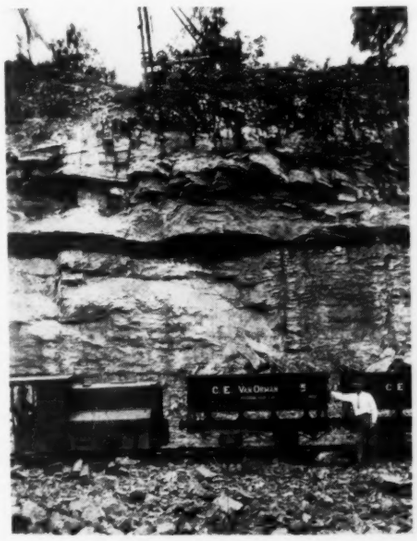


Shovel working at one end of the quarry

Cars dumping to the primary crusher

Large Oklahoma Ballast Plant

ONE OF THE largest crushing plants in the Southwest is located about one and one-half miles from Hartshorne, Okla., on a spur built from the Rock Island railroad main lines. The plant, operated by C. E. Van Orman, produces from 20 to 24 cars of railroad ballast each 24-hr. day. At present it is busy filling an order for 750,000 cu. yd. ballast for the Rock Island railroad, but soon production of concrete aggregate and commercial roadstone will be started in addition to the ballast requirements.



Center of the quarry showing the nature of the limestone deposit

The deposit is a blue limestone said to be admirably suited for ballast or concrete aggregate. It is a ledge about 2500 ft. long and from 60 to 110 ft. in height. An opening of 900 ft. has been made along the length and the shovel works at both ends of this opening as desired. Drilling is done by six Sullivan jackhammers and a Keystone well drill. A Sullivan type "V" air compressor supplies air for the jackhammers and the Sullivan drill sharpening outfit. A Bucyrus-Erie 41-B electric shovel is used for digging the rock and this loads to 5-yd. Western side-dump cars. There are 10 of these cars in use and they are hauled to the plant receiving hopper in trains of four or five by an 8-ton Plymouth gasoline locomotive. A line of 36-in. gage track runs from the hopper to the quarry face.

The crushing plant is equipped with modern new machinery, all electrically driven, and includes a Traylor "Bulldog" jaw crusher for initial breaking; a Symons No. 5½ cone crusher for secondary reduction and a 24-in. by 6-ft. Traylor vibrating screen. All this equipment is operated through Texrope drives.

The company's main office is at Yoakum, Texas. B. M. Van Orman is manager of the Hartshorne plant and R. E. Koepp is superintendent.

Crushing and screening plant

Cement Reference Laboratory Begins Operations

THE CEMENT REFERENCE LABORATORY, recently established at the Bureau of Standards, under the sponsorship of Committee C-1 on Cement, of the American Society for Testing Materials has begun the inspection of cement testing laboratories as part of the program to secure improvement in the testing of cement. The inspectors are now in the field, caring for some of the requests already received. There is no fee for the work done in the field. However, the inspectors will visit only those laboratories which request their services and it may not be possible for them to visit some localities very frequently. Therefore, those laboratories which desire but have not already requested inspection should promptly address the Cement Reference Laboratory, Bureau of Standards, Washington, D. C., in order that advantageous schedules may be arranged for the inspectors.

Discussion of the Bureau of Public Roads' Tests of Aggregates

By Edmund Shaw
Contributing Editor, Rock Products

IN OPENING the recent symposium on mineral aggregates of the American Society for Testing Materials, R. W. Crum said that research in aggregates had only started; and F. H. Jackson devoted a whole paper to discussing the necessity of such research. But a very considerable advance in such research has now been made, as is shown in the report by W. F. Kellerman on the investigations of the United States Bureau of Public Roads, published in *Public Roads* for June and abstracted in the July 6 issue of ROCK PRODUCTS.

Physical Properties of Aggregates of Great Importance

This report shows quite definitely that certain physical properties of aggregates may have more effect on the strength of concrete, compressive, tensile or flexural, than the water-cement ratio, which is usually taken to be the principal factor. In this it confirms Goldbeck's conclusion which followed his tests made in the National Crushed Stone Association laboratory. But it equally confirms the work of Gonnerman and Shuman of the Portland Cement Association regarded the *relative* effect of the water-cement ratio on the modulus of rupture, the small effect of the grading of the coarse aggregates within the usual limits and the relations between modulus of rupture and compressive strength for richer and leaner mixes. The effect of the percentage of wear on the value of an aggregate for flexural strength, which was left an open question by Goldbeck's tests seems to be definitely determined as negligible. A new factor, that of mineral composition, is shown to be of immense importance, and the favorable effect of angular shape and rough surface texture is made evident, although precise values cannot be attached to these factors as yet.

These tests, as do those which have preceded them, when they are interpreted fairly, emphasize that we must cease to classify aggregates by the general source from which they originate and judge them solely by their individual values. It is no longer possible to claim for an aggregate that it must be so and so because it is crushed stone or that it must be such and such because it is gravel or slag. In this test, the highest average modulus of rupture was that of a crushed limestone, No. 46 (590 lb.), but two gravels practically equaled it, Nos. 67 and 68 (580 and 585 lb.), and they had the decided advantage of a lower cement factor. Sandstone, with a high percentage of wear and high absorption, such as gave a low modulus of rupture in the tests of Lang and of Gonnerman and Shuman, gave an average modulus of rupture (530 lb.) and the highest average compressive strength of all (3470 lb.) with an average cement factor. The single specimen of trap rock tested (diabase and basalt) gave less than the average value of modulus of rupture and the lowest average compressive strength of all (2850 lb.). But trap rock in the famous New Jersey tests and in Goldbeck's tests to determine the effect of stone dust (ROCK PRODUCTS, February 2, 1929) showed a high flexural strength. Slag gave among the highest values for modulus of rupture (515 to 555 lb.) with grading No. 1 and fair values with grading No. 3, but it was not considered suitable for testing with the gradings that would give harsher mixtures. Thus, as in those tests on materials which have preceded it, the *individuality* of the aggregates stands out pre-eminently.

Effect of Character of Aggregates

The conclusions drawn from these tests appear to be stated conservatively, which is proper, as the number of tests was too limited for generalization in so extensive a field. Probably everyone will now agree that "the tensile, flexural and compressive strengths are affected appreciably by the character of the coarse aggregates used," and that "the tensile and flexural strengths are affected to a greater extent than the compressive strength." Also, that "aggregates composed wholly or in part of crushed fragments produce concrete of greater flexural strength than aggregates of rounded particles," since the results of other tests equally appear to show this to be true. These conclusions might have been predicted.

But the conclusion "That there is a fairly definite relation between certain mineralogical characteristics of the coarse aggregate and the strength of concrete, calcareous aggregates in general giving consistently higher strength than siliceous aggregates," may come as something of a surprise. This does not say that all limestone and dolomite aggregates, whether gravel or stone, will give higher strengths in all cases. In these tests one siliceous gravel, No. 50, gave a higher modulus of rupture than one limestone, No. 63, for all mixes and gradings. But the tests as a whole seem to justify this generality, so far as any generality concerning aggregates can be justified. And no previous investigation of which the writer knows has brought this out.

The igneous rocks tested, trap and granite, are in the intermediate group. It would be interesting to have further testing on these, because they are held in such high esteem as concrete aggregates in those parts of the United States where they are produced and in European countries. Some of the older English writers used to lay down the rule that igneous rocks were to be preferred to sedimentary rocks as aggregates. It might be worth noting that slag, which may be considered as an artificial igneous rock, has a fairly high calcareous content and gave high values for modulus of rupture.

Effect of Grading

Regarding the effect of grading, it is concluded that, within the limits of this study, "the grading of the coarse aggregate has no consistent effect on the strength of concrete." The results justify this, but the limits of the study were somewhat narrow. The variations in grading were such as hardly to affect the percentage of voids at all. For some aggregates the percentage of voids was identical with all four gradings, and with most of them the variation was only 1% and the greatest variation for any aggregate was only 2%. The variations in grading are probably such as might be met with in ordinary commercial aggregates, and it was correct to test them that way. But if it were desired to examine the effect of grading particularly, a wider variation would have to be studied, and it is probable (judging from some results in other tests) that a wider variation in strengths would have been shown. Gonnerman and Shuman came to the same conclusion regarding grading, but the effect of grading was not evident in their tests, as all samples were mixed with sand to the same fineness modulus, 5.65.

Differences Ascribed to Grading

Despite the conclusion drawn, there were certain differences that can be ascribed only to grading, and the report calls attention to one of them, Aggregate No. 66, a limestone gravel. The spread is shown graphically in Fig. 7 of the report, but it is even better

shown by tabulating the results, taken from Table No. 8, like this:

MODULI OF RUPTURE OF AGGREGATE No. 66

Mix	Grading 1	2	3	4
1 : 1.6 : 3	546 lb.	625 lb.	635 lb.	700 lb.
1 : 1.6 : 4	635 lb.	580 lb.	590 lb.	640 lb.
1 : 2.0 : 4	570 lb.	535 lb.	550 lb.	555 lb.
1 : 2.0 : ½	505 lb.	525 lb.	530 lb.	575 lb.
Average	588 lb.	566 lb.	576 lb.	618 lb.

The highest values are found in the fourth column, which had the most *fine* material in the coarse aggregates, although they lower, as all the others do, with the decreased cement factor, as more coarse aggregate and less sand is used in the mix. It is hard to escape the conclusion that it would be better to use grading No. 4 than any of the others in designing a mix, and this implies that the effect of grading should not be taken for granted when an unknown aggregate is being tested.

The average of the effects of grading was undoubtedly lowered by the effect on the siliceous gravels, all of which showed only slight variations in strength for any grading. A fair example is Aggregate No. 68, which gave about the average values for modulus of rupture:

MODULI OF RUPTURE OF AGGREGATE No. 68

Mix	Grading 1	2	3	4
1 : 1.6 : 3	570 lb.	610 lb.	595 lb.	570 lb.
1 : 1.6 : 4	540 lb.	520 lb.	540 lb.	565 lb.
1 : 2.0 : 4	480 lb.	480 lb.	500 lb.	495 lb.
1 : 2.0 : 4½	485 lb.	470 lb.	480 lb.	515 lb.
Average	519 lb.	520 lb.	529 lb.	534 lb.

The differences in this case are such as would be neglected, although there is some advantage for grading No. 4, as in the previous example. The mineralogical composition appears to outweigh the effect of grading with such aggregates, and it does the same with aggregates Nos. 44, 64 and 65. The graph, Fig. 7, shows little effect for grading, although the effect of varying the mix, as shown in Fig. 5, is as much as with the other aggregates. It is evident from the tabulation above that there is a prompt response to a slight increase in the cement content, as is shown by the wide difference between the 1 : 1.6 : 3 and the 1 : 1.6 : 4 mixes except with grading No. 4.

Conclusions Do Not Apply to Total Grading

Of course the conclusion referred to does not apply to the *total* grading, that is, coarse aggregate plus sand, and for the benefit of readers who may not be familiar with the relations of water-cement ratio, volume or yield, cement factor, consistency and strength, it may be well to go into this a little further than the report does. The consistency was kept constant for all tests. The yield is not stated, but the volume for any particular aggregate and grading is in inverse proportion to the cement factor. Then as more coarse aggregate and less sand is used in the mix, the water-cement ratio increases, the cement factor decreases, the volume increases, the consistency being constant. These are the relations brought out by the work of Abrams and many others on the compressive strength, and more recently by Gonnerman and Shuman on the flexural strength. Three examples, the values from Table 8 of the present test, will show how the work of others is checked by it, all the aggregates being from the group with intermediate strengths:

AGGREGATE, SILICEOUS GRAVEL, No. 50, GRADING No. 1

Mix	Water cement ratio	Cement factor	Modulus of rupture	Comp. strength
1 : 1.6 : 3	0.73	6.60	590	3460
1 : 1.6 : 4	0.77	5.80	570	3210
1 : 2.0 : 4	0.87	5.42	510	2750
1 : 2.0 : 4½	0.90	5.02	490	2550

AGGREGATE, ARGILLACEOUS LIMESTONE, No. 63, GRADING No. 2

Mix	Water cement ratio	Cement factor	Modulus of rupture	Comp. strength
1 : 1.6 : 3	0.85	6.93	545	3640
1 : 1.6 : 4	0.95	6.05	525	3380
1 : 2.0 : 4	1.04	5.62	485	2900
1 : 2.0 : 4½	1.09	5.31	465	2870

AGGREGATE, GRANITE, No. 60, GRADING No. 3

Mix	Water cement ratio	Cement factor	Modulus of rupture	Comp. strength
1 : 1.6 : 3	0.77	6.76	570	3710
1 : 1.6 : 4	0.85	5.89	520	3530
1 : 2.0 : 4	0.97	5.46	480	2660
1 : 2.0 : 4½	0.99	5.11	440	2620

The compressive strengths decrease as the water-cement ratio increases, as they should according to Abrams' law, although the values are higher, since all portland cement is of better quality than it was when the law was formulated. The modulus of rupture decreases but not in the same proportion, being a lesser proportion of the higher compressive strengths. (The percentages of the compressive strengths vary very little from those in Gonnerman and Shuman's table. For Aggregate No. 50 they run about 1% higher; for No. 63, about 1% lower, and for No. 60 they are the same for two and 1% lower for two.) The report of the present tests notes of such relations as these in its third conclusion. In fact, there is nothing particularly disturbing in these tests to the established theories of concrete mix design. They hold so long as the properties of the aggregate are the same.

Nothing is said about the effect of increasing the fineness modulus in these tests. Gonnerman and Shuman found a regular increase from 295 lb. (F.M., 2.10) to 670 lb. (F.M., 6.001), after which the curve tended to flatten. It may be presumed that in these tests the fineness modulus was above a point where it would be much affected by increases or decreases.

Effect of Water Cement Ratio

Goldbeck's tests showed no consistent relation between the water-cement ratio and flexural strength, and it is impossible to find such a relation in his graph. However, his tests covered such a wide range of gradings and percentages of voids, to say nothing of physical properties, that this is not surprising. They were intended to show the wide variation that comes from mixing by arbitrary proportioning, and they show it amply. But in the case of these latest Bureau of Public Roads tests the relation is consistent for any particular aggregate, as shown in the tabulation above. The graph showing the relationship of water-cement ratio to any strength as a whole is a broad band of almost parallel lines, the width of the band accounting for a difference, roughly, of 150 lb. in modulus of rupture and 750 lb. in compressive strength. This difference must be ascribed to variations in the properties of the aggregates. Similar charts have often been made where the strengths of a number of aggregates have been plotted against the water-cement ratio or the fineness modulus. The writer has seen them in the offices of highway engineers.

Effect of Shape

Regarding the effect of shape on the water-cement ratio, the report says: "It seems reasonable to suppose that, other things being equal, an aggregate having rounded surfaces would require less water than one having angular surfaces. However, examination of Table No. 6 fails to reveal any significant differences that may be attributed to this factor." This is astonishingly true of this particular series of tests. Aggregates Nos. 50, a siliceous gravel, and 62, a cherty limestone, for example, have very close water-cement ratios for every mix and grading. However, there is so much evidence the other way that it does not seem right to lay down a general rule that shape does not affect the water-cement ratio. For example, in the curves showing the relation of slump and cement factor to the water-cement ratio accompanying Series 212 of the Portland Cement Association's research, gravel aggregates give regularly about an inch more slump for all the proportions of water used than limestone aggregates. The matter is important, because of its bearing on the design of concrete mixes, and it ought to receive further study.

It was reported to be impossible to determine absorption so that the effect on the water-cement ratio could be determined with sufficient accuracy to use it as a connection. But it is supposed that this effect was such that the net water-cement ratios were practically the same throughout. One might judge that the high absorption of No. 61, sandstone, accounted for its high compressive strength, if it were not for the fact that No. 63, an argillaceous limestone, with the same absorption percentage, gave considerably lower strengths in flexure and compression, although the cement factor was slightly higher.

There appears to be no relation between the percentage of wear of a coarse aggregate and the flexural test of concrete made from it in these tests, although there did appear to be such a relation in Goldbeck's tests. But, as he was careful to point out, it was impossible to say definitely that such a relation existed, as the coarse aggregates with the highest percentages of wear made concretes with the lowest cement content. A somewhat cursory examination of Gonnerman and Shuman's tables also leads one to believe that there is no direct connection between percentages of wear and flexural strength for ordinary coarse aggregates. Of course, an aggregate that was decidedly deficient in structural strength would show a very high percentage of wear, high enough to show that it should not be used at all if flexural strength were wanted, but such aggregates were not used in the present tests. It is possible that gravels No. 28 and No. 31 in Goldbeck's tests were aggregates of that kind, as one had a percentage of wear of 26.2 and the other of 28.1. They gave the lowest values for modulus of rupture of all samples tested.

The present report (U. S. Bureau of Public Roads) says: "These tests also indicate that the compressive strength of concrete may be affected by the character of the coarse aggregates to a considerably greater extent than has been shown by prior investigations." It would be perhaps more accurate to say that the evidence has not been recognized by prior investigators. There is a wide difference in compressive strengths in Goldbeck's tests (4300 lb. and 3160 lb.) and the higher compressive strength is found with the higher water-cement ratio (0.88 and 0.81). This is not an isolated case, for a search through any series of tests that includes a number of aggregates will show differences in compressive strengths that can only be accounted for by differences in the properties of the aggregates. There is one long series in which gravel and crushed limestone are the aggregates and the crushed limestone shows about 11% greater compressive strength that the gravel all through. Such differences when noted by some earlier observers were held to prove that the water-cement ratio law was only approximately true, but it seems from the present test and others that variations in compressive strength, other things being equal, must be ascribed to properties of the aggregates used.

Effects of Voids

As the variations in grading did not affect the percentage of voids particularly, the effect of variations in voids with any one coarse aggregate is not apparent. But as between different aggregates there is a wide variation and these variations are shown in a graph, Fig. 10, which gives the relation of voids to cement content for all gradings. The average relation for all gradings is a straight line, but there is a considerable scatter of the points, especially in gradings No. 2 and No. 3. This is something that seems to be worth further study. Kriege (Rock Products, December 22, 1928) says that differences in strength, often ascribed to other things, are usually due to differences in the true cement content of the samples tested, and he found variations of 10% and even 15% in both cement content and strength in neighboring samples from the same mix, where the work was done by trained workers and every precaution was taken to insure uniformity. It would be well to know all the reasons for such variations, for it seems impossible that the variations in the percentage of voids in the coarse aggregates could account for all of such wide variations in the cement content.

Economic Value of Individual Aggregates

The present series of tests seems to show that variations in the properties of the aggregates used may outweigh variations in the cement content. Some slight differences of the kind are shown in the tabulations already made for Aggregates Nos. 50, 63 and 60, given above. A better idea can be had by finding the economic value of each aggregate, which can be done by dividing the modulus of rupture and the compressive strength of each aggregate by the cement factor, the number of sacks required for a yard of concrete. A chart of these economic values is given in the report, but to the writer's mind a clearer showing is made by putting the results in tabular form. Such a table, made to include all types except slag, for which no averages were given, is shown below, the values being taken from Table No. 5 of the paper:

Aggregate	Modulus of rupture lb. per sack	Compressive strength lb. per sack
No. 63. Argillaceous limestone	83.5	530
No. 44. Siliceous gravel	85.7	514
No. 40. Trap	86.3	470
No. 60. Granite	89.0	517
No. 50. Siliceous gravel	94.2	527
No. 62. Cherty limestone	99.7	497
No. 66. Limestone gravel	102.8	581

The values are so arranged in relation to the flexural strength, and the values for compressive strength do not run the same way. One of the things which the report points out is the importance of considering this in ascertaining the economic value for the strength wanted, and it is well illustrated by a comparison of Aggregates No. 63 and No. 62. No. 63 would be the cheaper if compressive strength was wanted, as it gives 530 lb. per bag, while No. 62 gives only 497 lb. per bag. But if flexural strength was wanted, No. 62 would be cheaper, as it gives 99.7 lb. per bag, while No. 63 gives only 83.5 lb.

The values for the modulus of rupture were obtained by breaking the beams in a portable cantilever testing device. For this method of loading they seem low in comparison with the results from other tests, although of course no direct comparison can be made. But Gonnerman and Shuman in their investigation of the method of loading for the flexural test and its effect on the modulus of rupture found that cantilever loading gave consistently and appreciably higher results than the third-point loading which they used in their work. The average of their tests on gravel with grading A, the grading for which the greatest number of examples is given, is 542 lb., and for limestone, with the same grading, 559 lb. The average in the present series of the values in Table No. 5 is 534 lb. The average of all moduli of rupture in Goldbeck's tests, for both gravels and limestones, is about 635 lb., practically 100 lb. higher. Center loading was used in these tests. This comparison is not made by way of criticizing anyone for using a particular method of testing, but to call attention to the difficulty of comparing results where different methods of loading are employed. It would make for a clearer understanding of flexural strength if all testing authorities used the same machine and the same method. The portable cantilever device used in the present tests appears to be one that could be installed at not too great a cost.

Size Distribution of Finely Ground Powders

THE DETERMINATION of the size distribution of very finely ground powders is of considerable importance in the solution of problems connected with the properties of Portland cements, of clays for ceramic purposes, of pigments, etc. Heretofore no satisfactory method has been available for the dry separation of finely powdered materials into sizes below 20-30 microns (one micron = 1/25,000 of one inch). In connection with research on the utilization of anhydrite for retardation of portland cement, the Nonmetallic Minerals Experiment Station of the United States Bureau of Mines, Department of Commerce, in co-operation with Rutgers University at New Brunswick, N. J., has developed an air analyzer for fine powders. This machine is capable of making very clean-cut separations into sizes 0 to 5 micron, 5 to 10 microns, 10 to 20 micron, etc., of powdered gypsum, anhydrite, cement, clays, pigments, etc. The essential difference between the new machine and those used heretofore consists in avoiding constructions which result in very sudden changes of air velocity, and in the use of an all-metal apparatus which is carefully grounded so as to rapidly carry off electrostatic charges which are responsible for the sticking of the powder to the sides of the apparatus. A detailed description of this apparatus and the results obtainable with it is to be published in the near future as a Bureau of Mines technical paper.

Ocher and Ochery Earths*

Extracts from a Survey of the U. S. Bureau of Mines—Use of Hydraulic Classification

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OCHER OR OCHERY EARTH is a natural mineral pigment composed largely of clay permeated with hydrated iron (ferric oxide).[1] Its color ranges from yellow through orange to reddish brown, depending largely on the amount of iron present. Ocher grades into sienna, which differs from ocher chemically in that it generally contains more ferric iron than it does clay, and physically in that when finely ground it is more of a stain than a pigment. Good grades of ocher should contain 20% or more iron oxide, but the iron content and hence of the material marketed varies widely. Ocher has a specific gravity of about 3.5.

Color Variations

Cream ocher contains as low as 5% iron hydroxide. It is used to some extent as a primer on wood, but has little value as a pigment.

Gray ocher is silica, clay, and carbonaceous matter. Sometimes is it colored slightly green by a trace of ferrous hydroxide. It is used as a filler for cheap paint.

White ocher is nothing but ordinary clay, and has no value in paint, although it is occasionally used as an adulterant.

Golden ocher is ocher which has been toned up with some chrome yellow. Various shades of it are on the market. Perfect orange-colored shades contain as much as 12% to 15% chrome yellow. The base may be either French or domestic ocher.

Green ocher is similar in composition to gray ocher except that it contains a larger proportion of ferrous hydroxide. It is found principally in Bohemia (Czechoslovakia), and goes by the name of "terre verte." It has no hiding power when used alone in paints, but as it has a high absorbent capacity for certain aniline colors, it is largely used as a base for cheap lakes. Verona green, Veronese earth, green earth, etc., are similar products.

Red ocher is obtained by calcining raw ocher at a low heat so as to drive off a part of the combined water. The shade depends upon the time of heating and the iron content—the longer the calcination the more purple the product. Burnt ochers are sold as Indian red, Venetian red, light red, etc. As a rule, however, these ochers are much richer in iron than the ordinary ocher which almost never contains more than 30% iron oxide.

Use and Specifications

There are two principal uses for ocher—in paints and as a filler for linoleum and oil cloth. Ocher is also used to a limited extent as a pigment in coloring cement stuccos and mortars, for producing desired colors in earthenware when mixed with manganese oxide, and in very limited quantities for other minor uses. It does not seem to follow that the best ocher for color pigments in paints is necessarily the most desirable as a filler in linoleum.

Domestic ochers of the best quality make excellent pigments, work well with all vehicles and with other pigments, and are permanent in color. When mixed with white, fine cream or buff tints are obtained. Chrome yellow is sometimes added to ocher of inferior color to impart a brighter tint than the natural color, but the chrome yellow fades after a time and leaves only the natural ocher effect.

Color would seem to be less important in ocher for use in linoleum and oil cloth, and this perhaps accounts for the fact that a large quantity of domestic ocher has been exported for use as a filler, giving as good service as the better colored but more expensive French ocher.

Georgia ocher has been used chiefly as a filler in the manufacture of linoleum and oil cloth, and much of it has been exported to England and Scotland for that purpose. Some of it is used for the same purpose in this country. It is also employed in the manufacture of paints, and in a variety of minor ways. This ocher when calcined yields a red pigment which is becoming of importance, especially as a mortar color, and is finding its way into the markets in growing quantities. Pennsylvania ocher has been used principally in the manufacture of paints.

Specifications prepared and recommended by the United States Interdepartmental Committee on Paint Specification Standardization, published in Circular 91 of the Bureau of Standards, states that the dry pigment shall be a hydrated oxide of iron permeating a siliceous base, and shall be free from added impurities. It must all pass a 200-mesh screen, contain no less than 17% iron oxide, not more than 5% lime—no lead chromate or organic colors.

Mining

As a general rule, ocher is a decomposed product or iron-bearing mineral which has been transported by water (often in admixture with clay) and finally deposited in seams, pockets, or what at one time were shallow pools. Occasionally, as in Georgia, it is found just above bedrock and beneath a residual capping—sometimes even it extends downward into cracks and fissures of the bedrock; more often, however, it forms irregular masses or lenses in residual or transported clays.

Most of the ocher deposits in the United States can not be mined systematically because of their irregular and pockety nature. Wherever possible, the overburden is stripped off, but when it is too thick, either tunnels are driven into the hillside or shafts are sunk, depending upon the topography. Shorter drifts or tunnels are driven from the main openings at suitable points, and the ocher is mined wherever it is found. A number of levels, one above the other, have been opened at several localities.

Even when the deposits are quite dry, timber ordinarily has to be used in the main drifts. Moreover, if either the ocher or the overburden is at all wet, timbering must be kept close to the face, and it will be necessary to mine out a given block of ground as rapidly as possible before too much weight comes on the timbers or before the wet clay or ocher oozes excessively into the workings. In Pennsylvania, where the deposits are erratic and the pockets of ore are relatively small, operations are at present all open-cut, although shafts are at times employed wherever the beds lie more than 10 to 15 ft. below the surface. The ocher, since it is more or less mixed with clay, must be removed very carefully; otherwise, since the clay can not be removed by washing and settling, the product becomes too low-grade.

The mining methods employed in Georgia, since they are conducted on a more extensive scale and are adapted peculiarly to local conditions, are described separately, as are also the methods used in France.

Preparation for Market

The preparation of ocher for market is ordinarily quite simple, involving merely a rough separation of the ocher from impurities that may be mixed with it. The sequence of processes is essentially similar in

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[1]United States Tariff Commission, Tariff Information Survey, Par. 55, Act of 1913, A-15.

all districts and includes washing, drying, pulverizing, and packing. The purpose of washing is primarily to rid the product of sand, small stones, and other foreign matter which may be associated with the ocher in nature or which has been mixed with it in mining. The washing process, however, since it thoroughly mixes the ocher, enables a more uniform product to be prepared. Sometimes it is also possible to improve the color or to produce minor modifications in the shade.

In Georgia, due to the fact that several of the deposits are large enough to justify the requisite expense, the plants are permanent and relatively more elaborate than in Pennsylvania, for example, where the deposits are small. As delivered to the washer, the Georgia ore contains 30% to 40% ocher, mixed with quartzite fragments, clay, sand, and a little barite. Large rock fragments are rejected on a grizzly, and water under pressure is used to disintegrate the material and wash off ocher adhering to coarse rock. The ore then passes to a single 26-ft. log washer. The logs are of yellow-pine, 18 in. in diameter, with chilled iron flights attached with lag screws. They are given a slope of 1 in. per ft., and are rotated at the rate of 20 r.p.m. As the coarse discharge leaves the log it is raked over a fine (about 12-mesh) screen and passes under water sprays to remove the last of the ocher before it is sent to waste. The fines through this screen, after being roughly classified in settling boxes, join the overflow from the log. The ocher, largely in suspension, can then be passed slowly through about 150 ft. of wooden launders approximately 10 in. square and with a slope of ¼ in. in 16 ft. The sand not eliminated in the log settles out in these troughs and is continually shoveled out by hand and thrown away. In place of the launders, a classifier may be used. The washer has a capacity of 2 to 3 tons per hour.

Separation by Classifiers

The operation of the plants differs considerably in detail from this point on. The Georgia Peruvian Co., realizing that it was losing a large quantity of ocher by the old method of separating the sand in settling troughs, installed three James slime separators or classifiers in a plant located midway between the washer and the finishing plant.[2]

The entire mine output except the coarse discharge of the washer passes through the separators which recover 96% to 98% of the ocher, separating all sand and other material over 300-mesh. Each of the three machines will successfully discharge (as overflow) from two to three tons per hour of minus 300-mesh ocher. At times, as high as four tons per hour has been discharged.

These separators, which were designed especially for this particular operation, consist of cones 14 ft. in diameter. Material coming from the log washer is fed into the center of the cone by means of a launder. The ocher and slime overflow into a peripheral launder 12 in. wide. The coarser sand settles against a rising current of water that enters the cone at the bottom and is supplied from an overhead tank. The velocity of this upward current is carefully adjusted so as to effect the proper separation of sand and slime. The sand discharges through the spigot at the bottom into a small horizontal cylinder containing a flight conveyor which is operated by a 3-hp. motor mounted on top of the cylinder. This cylinder is an integral part of the cone. The flight conveyor stirs and scrubs the sand, releasing the particles of ocher that may be held between the coarser material; the ocher thus freed is pumped back into the top of the cone by a small centrifugal pump mounted on and integral with the conveyor-cylinder. The sand tailings receive a very thorough scrubbing in fresh water, which is introduced into the discharge end of the cylinder through a second pipe line from an overhead supply tank. The flight conveyor rotates at 18 r.p.m. and has a double set of flights, so that the sand is moved very rapidly through the cylinder and is finally discharged as waste.

Thickening

Before the slime separators were installed, the ore pulp after passing through the settling troughs to get rid of the sand was delivered to a 10 by 26-ft. Dorr thickener preparatory to going to the drier. A very much larger volume of water, however, is now required to effect the thorough scrubbing given the sand in the separators, so that it has become necessary to install another and larger thickener. The small thickener can handle a monthly tonnage equivalent to a little over 500 tons of finished ocher. The capacity of the new thickener, which measures 8 by 34 ft., is roughly estimated at 600 to 700 tons of finished ocher monthly. The pulp entering the thickeners contain about 30% solids, and the spigot discharge contains about 60%. The pulp is pumped to the thickeners from the separators by a centrifugal pump driven by a 25-hp. motor.

Dryers

The thickened product of the Dorr tanks is pumped by a 5-hp. motor Dorrco pump to two agitator tanks, 8 by 10 ft. and 6 by 10 ft., respectively, which are home made. From these the thickened ocher passes through 1½-in. pipe to a so-called sprayer box at each drum drier, 16 by 12 in. in cross section, through which box a 3-in. shaft, studded radially with 3-in. pins or bolts, runs longitudinally. The shaft rotates at 200 r.p.m. in the pulp, and the pins spatter the ocher on to the slowly revolving surface of the drum. The drum is 10 ft. long and 4 ft. in diameter. Live steam at 80-lb. pressure is introduced into the center of one end of the drum, and the condensed steam falls to the bottom where the pressure within the drum expels it via a stationary pipe bent to form a siphon which passes out of the drum through the center of one end and thence to the boiler via an ordinary steam trap. These driers have been developed in the Cartersville district and are surprisingly efficient in view of the amount of water evaporated per pound of steam.

The ocher is in contact with the hot surface of the drum only long enough to be thoroughly dried. It is scraped off at another point before it has a chance to darken through the loss of any of its water crystallization. Darkening is to be avoided, as it spoils the color and thus lowers the grade and value for marketing. There are five of these driers, each of which has a capacity for 24 hours' continuous operation of about 11 short tons.

At another plant the ocher-laden water from the washer and settling launder is run into a series of settling tanks. After standing, the excess water is siphoned off and the thickened ocher is shoveled into wheelbarrows and transferred to two long rows of drying vats, arranged along each side of a horizontal belt conveyor. The bottoms of these vats, which are 12 to 15 ft. square by 3 ft. deep, are covered with coils made of 1-in. pipe through which live steam is passed when the vat is filled with ocher sludge. When the ocher is thoroughly dry it is shoveled by hand into the conveyor. A disintegrator breaks up the large lumps, and after going through a pulverizer, the ocher is taken by screw conveyor and elevator to a sheet-steel bin over the packing floor.

Pennsylvania Methods

In Pennsylvania, the ore as it goes to the washer is mixed with clay and with modules and fragments of limonite and chert. The clay, of course, accompanies the ocher in the overflow from the log washers. The better part of the iron ore is separated from the chert by hand, and when enough of it accumulates it is shipped to some nearby furnace.

The ocher and clay are washed into a series of settling troughs that are slightly inclined so that the water passes through them rather slowly. The current is further retarded by baffle boards, behind which the coarser particles settle. At one mine there are 28 of these troughs each 14 by 16 ft. long and 13 in. wide. The coarse sand settles mostly in the first two or three troughs, and by the time the last one is reached even the extremely fine sand has been practically eliminated. From the sand troughs the ocher-bearing water flows to settling ponds formed by digging into the ground a few feet and placing the excavated material as an embankment around the sides. These ponds which are roughly rectangular in shape, vary in size, but they average probably about 40 ft. in length, 25 ft. in width, and 3 to 4 ft. in depth. Frequently they are

[2]Hubbell, A. H. An Improved Way of Washing Ocher. *Eng. and Min. Jour.-Press.* Vol. 118, No. 9, August 30, 1924, p. 336.

arranged in series so that the finest material will pass from the one pond into the next; the overflow from the past pond is carried off through a pipe. It is also possible to grade the material as it comes from the mine and then to turn the best grade of ocher into one pond and to send that having a large admixture of clay into another. When a pond is full, the surplus water is allowed to evaporate. This may require from a few weeks to several months, depending upon the weather. When the ocher finally reaches a condition where it can be readily shoveled, it is dug and hauled in wheelbarrows to the drying sheds and placed on long open shelves for final drying. In a few places steam drying sheds are used, but most of the ocher is air-dried. Some of the plants which have steam dryers use them only in winter when air-drying is impossible.

After drying, the material either is hauled at once to the railroad for shipment or else is ground in buhr mills and then packed.

At the old iron mines ocher was deposited behind the mud dams constructed to impound and clarify the muddy waters from the mines and washeries. Much of this ocher is mined with sand, but some of it even without washing is almost as good as that which has been carefully washed from natural deposits. As a rule the ocher from these old mud dam deposits is apt to contain a fairly large proportion of clay and sand and must be washed, but in the extensive deposits that accumulated about the larger mines that were worked for many years it is usually possible to find several layers of fairly clean ocher.

Ocher is produced more or less regularly in the following states named in order of importance: Georgia, Pennsylvania, Virginia, Alabama, California, Iowa, and Vermont. Deposits have been found in other states, but are not known to have maintained any important production. In the Pacific Northwest, however, certain deposits, notably in western Washington, are of considerable potential importance commercially.

A rock fountain made of different colored boulders cemented together

Are You Overlooking a Valuable By-Product?

MOST crushed-stone quarries and many gravel pits produce slabs and boulders as by-products, or as an intermediate product. How many quarry and gravel pit owners realize that such slabs and boulders are in constant demand by landscape architects, architects and home owners? The illustrations show some of the many uses of these products in a Chicago suburb. A correspondent, J. L. Graff, of Park Ridge, Ill., supplies the following information:

Here's a rock product now attracting a great deal of attention, located on the back lawn of a newly built brick home on Elmore avenue, Park Ridge, Ill. It is but one of many similar layouts now demanding more and more material for the same and similar purposes.

To such an extent has the call for "rockery" rock grown that some of the material dealers are carrying stocks as a side line. One dealer in Park Ridge has commenced the handling of several varieties of the material.

The rockery shown below extends the full width of the rear lawn and is built flush with the alley, shutting off all view of garbage and ash cans usually kept in the alley. Here the height of the stone work is about 4 ft., and the average width back on the lawn it averages 10 ft. There are several levels on which fertile soil has been spread, and on some of them and in big and small interstices a variety of plant life is now growing. In this soil among big and little stones are evergreens in different stages of growth. At the left the builder has reserved an elevated flat on which he has placed a common wire trash burner and in which he consumes different accumulations of all his lawns. There are several different kinds of stone mostly of the split or flag variety.

The work shown in the picture is all on one lawn, the four houses in the back ground are across the alley on the next street east. Entrance from this one lot to the alley is through a stone gate from a walk-way over the rockery.

Another citizen of Park Ridge has a novel exhibit built entirely of stone, but surrounded in part by wooden lattice (see above). It is a fountain over which water is sprayed most of the time during the summer season. Some of the stones used in the work were gathered by the builder during automobile trips that took him close to the shores of Lake Michigan and other bodies of water. Some came from the bottom of the Ohio river, these of the tufa variety, big and little boulders are cemented together in the formation of a pryamid.

A noteworthy example of the rockery building craze is to be seen near the Rand road in DesPlaines, Ill. A great variety of stones form the base of a Dutch wind mill which turns with the wind. Here among the stones is a very great variety of plants.

A rockery extended across a back lawn to shut off an alley view

Hints and Helps for Superintendents

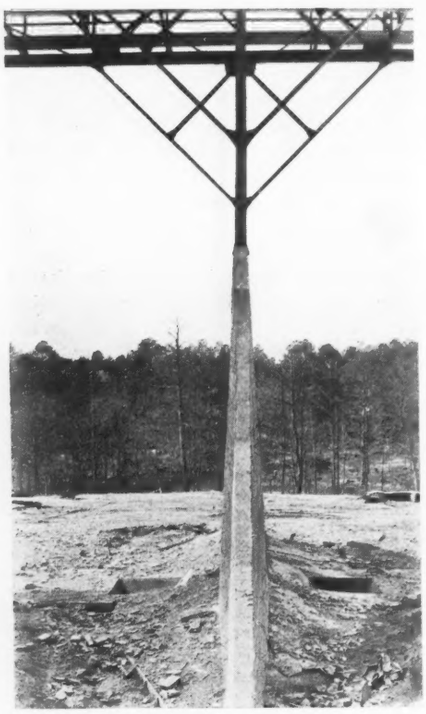
Crushed Rock Storage

CRUSHED stone operators are daily being sold on the idea of outside storage to allow continuous and efficient operation, reclaiming the stored material by reclaiming tunnels, draglines, clamshell excavators and portable conveyors.

The separation of two different sized materials is very often solved by a rather expensive bulkhead of massive concrete, but at one of the operations of the Florida Crushed Stone Co. near Brooksville, Fla., this problem is solved by a simple and cheap partition made of small diameter poles. This plant reclaims the material by means of a Sauerman dragline.

Another form of partition is that being used at the new plant of the Consolidated Quarry Corp. of Rock Chapel, Ga. This plant was recently put in operation and the stockpile filled from overhead conveyors and reclaimed by tunnels under the stockpile in which operate suitable belt conveyors.

The partition here shown acts as the supporting leg for one of the stockpile building conveyors and is made of reinforced concrete. The design is such that at the center of the concrete pier it is about 14 in. through and 6 in. at the outer edges.



Concrete partition wall which serves also as a foundation for the stockpile conveyor gallery

Inexpensive separating wall for stockpiles

The dividing walls may also serve as foundations for the washing plant as at the Material Service Corp. plant at Lockport, Ill. (ROCK PRODUCTS, August 17 issue.)

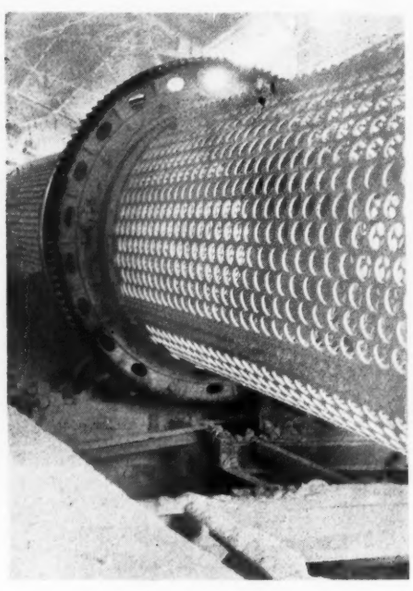
Converting Iron and Steel Scrap Into Grinding Media

IN A RECENT issue of *Engineering and Mining Journal,* John B. Huttl describes the construction details and operation of an air-operated casting machine unit which is capable of producing 1400 two-inch cast iron or steel balls per hour with a small force of unskilled labor.

The machine can be installed at plants having their own small foundries, with the intention of converting old scrap-iron or steel into balls for ball-mill grinding media. Detailed drawings and ample descriptive matter are presented in the article referred to, so that a working machine can be built.

Rotary Screen Mounted on Kiln Settings

AT THE Security plant of the North American Cement Corp. some commercial stone is produced which is all sized in a single and exceptionally long rotary screen. This screen has a single barrel and is 5 ft. by 56 ft. 6 in. long, and is mounted on rotary cement kiln settings. There are four sections of about equal lengths of ⅜-in., 1-in. and 2½-in. round perforations. The various sized products fall to bins below and any oversize goes to the cement plant proper. A 60-hp. motor drives the screen, which might appear excessive, but plenty of cheap power is available at the Security plant, as the waste-heat boilers supply more power than the plant can use when all the kilns are operating.



Long rotary screen mounted on cement kiln setting

Car Stop as a Safety Precaution

AT the Harbison-Walker Refractories Co. quarry near Mt. Union, Penn., the transportation system involves a 30 to 35-deg. incline 2500 ft. long, and also several miles of twisting, winding narrow-gage track to reach the deposits. This operation was described in detail and illustrated

Efficient car stop placed on a steep quarry track

recently in ROCK PRODUCTS, July 20, 1929.

The loaded cars assembled at the head of the long incline are prevented from running away down the slope to certain destruction, which might cause possible injury or loss of life to the workers below, by two 12 by 12's fastened to a steel shaft in such a fashion as to have their up-grade ends rise above the rails. These timbers, in a lifted position, thus prevent any cars on the mountain track system from getting a start down the incline. Raising and lowering of this protective device is done by a lever from the control room of the hoist operator.

It's the Little Things That Count

By R. B. Williams

THERE is an old fable to the effect that a tiny ant once saved the life of a huge elephant. That fable, translated freely means "pay attention to the details," for in and about every mechanical equipment there are countless details that require constant watching if operating costs are to be kept at the minimum.

Illustrated here, as an instance, is a gasoline shovel in operation on the property of a silica sand company in Illinois. To force home the importance of such details and the insidious menace of small leaks we have indicated by arrows and numerals a few places that commonly harbor cost boosters. Those indicated are by no means the only ones that can infest the average operation. They have been selected merely to afford an example of the losses that can be, and *are*, sustained by hundreds of shovel operators the country over.

1. All sheave bearings should be constantly watched for alignment and wear. Lack of proper lubrication at this point imposes unnecessary wear and rapid depreciation, while the constant side swinging of the loads are a constant strain on sheave alignment—and incorrect alignment means high mortality for rope and sheaves.

2. Watch the sheave grooves. If they are worn, excessive abrasion is set up and the outer wires of the rope will be subjected to undue wear and early breakage. If the sheave is not of the proper size the rope will be pinched—and a pinching sheave can do more damage to a wire rope in one hour than a proper sized sheave could possibly do in an entire month.

3. Look to the lubrication of the wire rope. At the factory its core has been thoroughly impregnated with the proper lubrication and the wires given a good coating of heavy lubricant. The dust and dirt and wear of daily operation, however, soon nullifies the value of this preparatory lubrication. A properly lubricated rope will last from three to four times as long.

4. Metal surfaces should be given a coat of suitable anti-rust covering at least once in every six months.

Just a Moment—

ANYONE who waits for times to get normal before doing something will never do anything. Many a false step is made by standing still. Footprints on the sands of time are not made by sitting down.
—Dewar.

5. Keep the dipper teeth sharp and full. A dull, chipped or broken tooth on the dipper will demand as much as 50% additional crowding power—and power is nothing more than fuel, in finished form.

6. Gears that have become worn or teeth that are slightly chipped require much greater power than is demanded of gears that mesh properly. Lubrication at this point means long life and satisfactory service—but lubrication can also mean needless expense, if the correct type of grease or oil is not used.

7. Wire rope should not be handled in a manner similar to that of rubber hose or hemp rope. Wire rope, not of the preformed type, will kink readily and once a kink has been formed no amount of strain will ever get it out. In changing from the shovel to the crane boom or vice versa, the rope should be handled by lifting the coil to its edge and rolling or unrolling along the ground.

8. If this operator should get into the habit of slowing up or stopping at 4:45 instead of 5 o'clock, he will, over the course of a 300-day work year, waste 75 hours of production time.

9. Crawler treads are difficult to lubricate. In spite of any difficulty, however, they should be given good care since they not only bear great weight, but are continually grinding against abrasive dirt, sand, gravel and other destructive elements.

"Don'ts" for Chain Users

A FOLDER on welded chain recently issued by American Chain Co., Inc., Bridgeport, Conn., contains the following advice to users of chain:

Don't load a chain above its rated capacity.

Don't subject a chain to jerky loads.

Don't use a chain that appears defective.

Don't fasten chain over sharp corners.

Don't save money by making "home made" slings.

Don't use slings at acute angles if avoidable.

Don't think annealing is a "cure all" for chain ills.

Don't buy chain of doubtful quality.

Don't tie knots in chains or allow them to become twisted.

Some of the places on a gasoline shovel which require attention

More About Compressed-Air Receiver Explosions and Their Causes

By C. O. Sandstrom
Los Angeles, Calif.

IN THE MARCH 16 issue of ROCK PRODUCTS, W. B. Lenhart gives a version of the cause of the explosion of an air receiver at Decatur, Ga., on February 28, which killed seven men. Mr. Lenhart described the receiver as being 5 ft. in diameter, 25 ft. long, 5/16-in. shell plate, "with the heads belled outward about 5 in." He did not give the thickness of the head plate, the kind of joints, nor the working pressure, all of which information would be necessary to determine whether the receiver was adequate for the service. If it is true that the head was "belled" or "bumped" only 5 in., we can be sure that it was subject to a rather high stress.

Heads of pressure vessels are usually formed to a radius equal to the diameter of the shell, with a small fillet, or "knuckle" curve, connecting the dished portion to the flange. If the head of the receiver under discussion were bumped to a radius of 5 ft., its depth would be about 8 in., exclusive of the flange. Failure of these heads generally occurs at the knuckle because of the high stresses existing there together with the flexing under the variation of pressure.

Receivers Should Be Placed in Safer Locations

The extent of the havoc wrought by the failure of this receiver places the cause without doubt in the realm of explosions of the kind occurring in the cylinders of internal-combustion engines. Given a mixture of air and hydrocarbon vapor of the proper proportion, all that is necessary is the spark to convert the receiver into a gigantic engine cylinder; and as usually constructed the receiver is torn apart, with much damage to surrounding property. I was once privileged to observe the effect of the explosion of an air-receiver which, strangely coincident, was 5 ft. in diameter and 20 ft. long—and there were seven men killed! In addition to the loss of life there were nine men injured besides a property loss of $20,000.

That the excess of oil used to lubricate air-compressor cylinders takes fire and burns is common knowledge. In the early days of compressed-air practice, red-hot piping and receivers were frequent occurrences. And even in these days, with a half-century of progress in the art as a guide, we have disastrous explosions of air-receivers, all because of an injudicious use of lubricating oil.

The amount of oil required to properly lubricate an air-compressor cylinder is very small—so small, in fact, that all but those thoroughly familiar with correct practice use too much oil on the assumption, perhaps, that if a little oil is good, a great deal would be better. The principle of liberality is never more mistaken than in the matter of lubrication. Oil sufficient to cover the surface is enough, any more is waste and, in the case of air-compressor cylinders, a menace.

There has been much speculation on the cause of air-receiver explosions. It is generally agreed that the immediate cause is the ignition of an explosive charge of oil-vapor and air. The disagreement is over the means of igniting the charge.

Causes of Air-Receiver Explosions

A cause frequently assigned to air-receiver explosions is the high temperature resulting from leaky valves permitting a portion of the hot air to return to the compressor cylinder and be recompressed until an ignition temperature is reached. A moment's consideration of the thermodynamics of gases will eliminate recompression as a cause of high temperature. Compressed air (and other gases), when allowed to expand and do work, as in the various air tools and the dense-air refrigeration machine, produces refrigeration. That this is a fact is well known to users of air tools; much annoyance being sometimes caused in improperly drained systems by the moisture freezing in the tools. Compressed air that merely expands against atmospheric pressure cools but slightly, the cooling being a measure of the product of the atmospheric pressure and the change of volume.

The leaky-valve hypothesis apparently presumes on the foregoing but, as reflection will show, erroneously. Let us assume a compressor with a leaky valve. The compressor has been running long enough to establish normal operating conditions of pressure and temperature. The piston is at the end of the compression stroke and is about to begin the suction stroke. The clearance space is filled with air at high pressure and temperature. The piston now moves away from the end of the cylinder. The air in the clearance space and the air leaking in through the discharge valve expands *and does work* against the receding piston. When the pressure has dropped sufficiently the suction valves open and admit air from the outside. As the expansion of air against a resistance produces a lowering of temperature, or refrigeration, how is it possible to attain an incendiary temperature by the means described? The idea has been expressed that the velocity of the piston is so great that there is not sufficient time for it to provide a resistance to the expanding air. This idea may be dismissed when we consider that the velocity of the piston is measured in feet per second, while air expanding from 80-lb. gage to a pressure less than atmosphere attains a velocity of hundreds of feet per second.

There is no doubt that air-compressors are running under every possible condition of leakiness; in fact, absolutely tight valves are probably not common. So if leaking valves contribute to high temperature, then red-hot piping and receivers should be the rule rather than the exception. If, then, leaking valves are not a contributing cause of air-receiver explosions, what is the cause? Can it be found in the catalytic effect of coke, oil and its impurities, iron, and the oxygen in the dense condition existing in compressed-air practice, and which is commonly known as "spontaneous combustion?"

Decomposition of Lubricating Oil

With an air intake temperature of 80 deg. F., single-stage compression to 80-lb. gage and with a temporary interruption of the flow of the jacket water, all of which factors are common enough in compressed-air practice, the final temperature of the air will approach 500 deg. F. At this pressure and temperature "cracking," or decomposition of the lubricating oil occurs, with a decomposition of carbon, or coke, in the air passages. Much of the oil vapor is condensed in the comparatively cool receiver, which oil provides the menace.

Charcoal (and coke to a lesser degree) has the power of adsorption of gases. This adsorption is accompanied by a rise of temperature, due probably to adsorption being a condensation and accompanied by a liberation of latent heat. Charcoal saturated with hydrogen sulphide and exposed to oxygen will take fire because of the rapid combination. Lubricating oil is probably never entirely free of the compounds of sulphur, among which is hydrogen sulphide. Now it may be that the ignition temperature occasionally obtained in compressed-air practice can be accounted for by the selective adsorption of hydrogen sulphide by the coke, and its rapid oxidation in the stream of dense air flowing to the receiver. The receiver contains a considerable quantity of

oil carried over from the compressor cylinder, which oil is vaporized by the rapidly rising temperature of the incoming air. When the correct proportion of vapor and air is reached, the explosion takes place.

Safety Precautions

If the foregoing explanation is correct, there are several things that can be done to assure safe operation of air-compressors. First, use the minimum of the proper kind of lubricating oil containing the least practical amount of sulphur compounds. Second, arrange for feeding a 10% solution of soap and water for two or three hours, substituting the lubricating oil but several times its quantity, at least once a week. Third, provide frequent and effective drainage of the receiver.

The injunction to "place the receiver as close to the compressor as possible" is a mistake and must be charged with the loss of many lives and much property. There is no practical reason why the receiver cannot be placed where its "letting go" will do little damage. Of course, placing the receiver near the compressor makes it convenient for the attendant, but this should not be the determining factor. The attendant would probably vote for locating the receiver at a safe distance should he learn that at none of the coroners' inquests following receiver explosions has the attendant been a witness.

A study of pipeline losses in compressed-air practice makes one curious about the origin of the advice to place the receiver near the compressor. By an inspection of the tables of pipeline losses, published by compressor manufacturers, we find that the friction loss in a 4-in. pipe 1000 ft. long, carrying 70 cu. ft. of air at 80-lb. gage (450 cu. ft. free air per min.), is 0.69 lb. per sq. in. Now, this is a small loss, and if the receiver be placed in the direction of the air tools is not a loss at all. In fact, so far as the operation of the tools is concerned, the receiver might better be near them.

Receivers Should Be Placed in Safe Positions

Manufacturers of air-compressors naturally do not stress the likelihood, or possibility, of air-receiver explosions, so it seems to me that municipal and state boards governing pressure vessels should take cognizance of the location of air-receivers—should see that they are placed where an explosion would do the least damage. The fact that only one of thousands do explode should not alter the case—one in many thousands is the record of steam-boilers, yet they are under strict control in most states. Safety valves afford relief in the case of high pressure in steam-boilers, but safety valves cannot relieve the explosion pressure in air-receivers. Air-receivers could be built to withstand the explosion pressure, but this would require very heavy and expensive construction; say, 1½-in. shell plate for a 5-ft. receiver, with heads considerably thicker.

Safe Using of Compressed Air Machinery and Equipment

A GENERAL discussion of how to operate with safety, air compressors and equipment is given in Safe Practices Pamphlet No. 47, published by the National Safety Council, Chicago. Some of the essential features for rock products operators are given herewith in abstract. They are:

Use a strongly built compressor, installed on a firm foundation, firmly fastened in place. The speed governors should be properly designed and well taken care of. At each installation the compressor should be of such size and capacity that it is unnecessary to operate at greater speed than that listed by the manufacturer. Excessive speed develops too much heat which increases the danger of explosion.

Air tanks or receivers should be made of boiler plate as specified in the A. S. M. E. boiler code. No air receiver should be operated at a pressure higher than the maximum allowable working pressure, except when the safety valve or valves are blowing. Never bury the tank underground or locate it in an inaccessible place. A cool place to condense moisture and oil in the compressed air is desirable.

A drain pipe and valve should be installed at the lowest point of every air tank to remove all accumulated oil and water. This valve should be opened and the tank drained at regular and frequent intervals. Under no circumstances should an air receiver be installed without a pressure gage and a spring pop safety valve. If possible, the pipe between the compressor and receiver should be installed without stop valves.

Dangers of explosion are increased because of decomposition (burning or cracking) of the lubricating oil, hence it is advisable to use only high grade mineral oils that have high flash points. Too much oil should not be supplied for this increases the explosion hazard. It is best to feed the oil into the cylinder by means of a sight feed lubricator. The usual recommendations provide for the feeding of one to four drops of oil per minute for small compressors, six drops per minute for those of medium size and 10 to 12 per minute for very large compressors.

Even the best of oil is decomposed to a certain extent by the intense heat in the air cylinder and leaves a deposit of carbon on the cylinder walls which may be carried over into the discharge pipe and air receiver. This deposit is flammable and becoming oil soaked may readily glow or burn, thus igniting any flammable or explosive mixture of oil vapor with which it may come in contact. There is also a possibility that the carbon deposit may be disturbed in such a way that it will form a dust which, mixed with air and ignited, may explode and do serious damage.

To prevent the formation of excessive carbon deposits it is advisable to feed the lubricating oil into the air cylinder slowly and to use only a high grade mineral oil. It is necessary to clean out the cylinder, valves, discharge pipe, and receiver at regular and frequent intervals—perhaps once a week, although the intervals may be shorter or longer, depending upon the operation of each installation. For this purpose many operators feed soapy water into the air cylinder for two or three hours at a time. In addition some also use a lye solution which is fed into the discharge pipe and not the compressor.

As an added precaution, the intake line should be located at a place where the air is pure and clean as possible. Sometimes screens or air filters are installed to remove objectionable coal dust, soot from smoke, etc. Temperatures in the air cylinders should be kept as low as possible; water cooling is of material assistance. Some installations have fusible plugs in the bonnets or other metallic parts of the air discharge valves which are so arranged that they relieve the air pressure automatically when the temperature exceeds a certain maximum.

The other parts of the pamphlet deal with compressed air utilization and safe operation of pneumatic tools.

Fire Follows Explosion of Air Compressor at Silica Plant

ONE MAN was injured and buildings damaged to the extent of $15,000 as a result of the recent fire at the Higby sand plant near Ottawa, Ill., owned by the American Sand Co. The fire followed an explosion, the exact cause of which was not known, but is generally attributed to the blowing up of an air compressor. Loss was covered by insurance, the report states.

One workman was in the building at the time of the explosion, although 13 others were working in the pit and outside the structure. This workman told officials of the company he had started the air compressor engine and the compressor had been operating but a few minutes when it exploded with a roar, splattering burning gasoline in all directions.

Efforts to subdue the flames with chemical apparatus and fire hoses were of no avail. All of the machinery within the building was destroyed and the structure itself, of heavy timber, was rendered a total loss by the fire.—*Streater* (Ill.) *Times.*

Slate Quarry Building Burned

FIRE of undetermined origin damaged the air compressor building at the Doney Slate Quarry, between Penn Argyl and Wind Gap, Penn., machinery and two motor trucks being ruined and the loss being estimated at $8,000. —*Philadelphia* (Penn.) *Enquirer.*

A Lime Research Laboratory

MISS MARY E. SQUIRE, whose research work on limestone and lime resulted in her developing an American "Vienna lime," which has replaced the original Vienna lime in many parts of the world, has established the "A. L. R. L."—Allwood Lime Research Laboratory—at Manitowoc, Wis., where she has long been a lime manufacturer. Miss Squire's work in connection with the development of Vienna lime manufacture and the making of other special limes has been described in previous issues of ROCK PRODUCTS.

A circular announcing the research laboratory states:

"Do you know that there are over 630 different uses for lime? How many of these special limes for a special purpose can you furnish?

Miss Mary E. Squire

"Do you know that there are special limes worth $200 per ton? Because limestones from which they are made are very scarce.

"Do you know the different limestones in your quarry—which are worthless and which are high-priced ones?

"Today is a day of facts founded on scientific data—statements about the quality of any product must be a provable fact.

"It is said 'The future success of any business lies in the research laboratory.

"You cannot 'kid' the public very long into believing your product is 'all right' if the quality is poor—no matter how you advertise.

"Why spend money to convert poor grades of stone into poor quality of lime?

"Every manager and superintendent should know, by sight:

1. The good average stone—that will make a good grade of lime.
2. The valuable stones—that make special chemical limes.
3. The worthless stones—no good for lime but may be suitable for some other use.

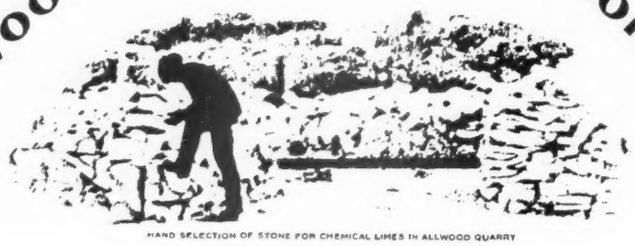
"The 'A. L. R. L.' aims to furnish practical and reliable information concerning—

1. Different varieties of limestone in your deposit, with their noted physical differences.
2. The chemical content of the different stones.
3. The suitability of your limes for different uses.

"If desired the research laboratory will suggest the kind of equipment best suited for any location and its approximate cost."

ONLY STANDARDIZED INSTRUMENTS USED

ALLWOOD LIME RESEARCH LABORATORY



HAND SELECTION OF STONE FOR CHEMICAL LIMES IN ALLWOOD QUARRY

LIME STONE QUARRIES INSPECTED
ANALYSES AND TESTS

MANITOWOC, WISCONSIN

From a letterhead of the Allwood Lime Research Laboratory at Manitowoc, Wis.

Clay

CERTAIN of the elementary factors affecting the potential commercial value of a clay deposit form the basis of Circular No. 6155 of the U. S. Bureau of Mines. A general description of clays, uses and products, nature of deposits are given.

Trap Rock Specification of 2.9 Gravity Causes Trouble

A SIGNED ARTICLE in the *Cleveland Press*, August 1, by Garland Ashcraft, contained the following statements:

County commissioners faced a puzzle of their own making this week when seven and one-half miles of paving, which should have been completed under the contract on or before December 1, last year, still was held up for lack of materials.

"Trap rock" was the "trap" in which the commissioners, County Engineer Fred R. Williams and the contractors found themselves.

One contractor, using a different trap rock from that on sale at the time the contracts were let, was ordered to stop work by county inspectors.

Early last year A. J. "Gus" Hieber, former clerk of the Board of County Commissioners and now a road materials salesman, obtained from the Bruce Mines in Canada the agency for Bruce Mines trap rock, and proposed to ship it here by boat.

Contracts on trap rock paving subsequently were let and contractors proceeded to get their stone from Hieber.

With these roads unfinished, Bruce Mines went into receivers' hands and suspended operations.

Then the "trap rock famine" hit the county.

Hieber's trap rock, coming from the ore region in the Georgian Bay district, is unusually heavy. Its specific gravity runs 2.9 and over. It also comes up to the usual specifications for good trap rock.

The country specificed trap rock of 2.9 specific gravity, and to date no other trap rock within a distance where freight would not be prohibitive, has been found to take the place of Hieber's.

Lime Company Charges Directors with Negligence in Suit

A CIVIL suit, charging negligence, was filed in U. S. district court recently by the Alabama Lime & Stone Co., naming a Birmingham, Ala., bank and six individuals as defendants.

The suit named as defendants: John H. Adams, Albert Stradford, Frank W. Miller, Frank C. Marquis, Webb W. Crawford, William J. Yeilding and American-Traders National bank.

The suit charged that several of the above were members of the board of directors and neglected to attend meetings of the board, causing loss which could have been avoided. It also charged that some of the properties of the Calera Development Co., which had been purchased by the plaintiffs, had not come into their possession.—*Birmingham* (Ala.) *Post.*

Editorial Comment

Good and Bad Logic

The United States Senate finance committee has left the United States House of Representatives ways and means committee proposal for a 30.4c per bbl. tariff on portland cement stand, but has eliminated the proposed tariff on lumber products. Unfortunately for portland cement manufacturers the proposed tariffs on lumber and cement have been coupled in much of the Midwest propaganda against the tariff. The lumber imported comes from Canada and from sources largely owned by producers in the United States, who were enterprising enough to foresee the exhaustion of forest products in this country. The only people who want a tariff on Canadian lumber are less enterprising competitors in the United States who wish to take advantage of the prospective shortage of American lumber. The action of the Senate finance committee would seem good logic and based on economic considerations.

There is no parallel in the case of portland cement. The contention that a tariff of 30.4c per bbl. would raise the price of cement 30.4c above the present price to Midwest farmers cannot be taken seriously by any reader of ROCK PRODUCTS, or any other intelligent man with the faintest knowledge of the industry. As a matter of fact the logic is all on the other side, for if all the producers of portland cement on the Eastern and Southern seaboards had national organizations with mills in the Midwest, they would be driven to increasing prices in the Midwest to make good losses suffered on the coasts because of the absence of a protective tariff. Actually, of course, the proposed tariff can have no effect, one way or the other, on Midwest cement prices because there are too many independent mills in both sections. However, absence of a tariff may force these independents into mergers for the very purpose of raising Midwest prices to recoup East and South coast losses to Belgian cement importers.

The Why of Protection

Of the 32,028,584 automobiles in the world on January 1, 1929, 24,629,921 were in the United States. Probably no other simple fact so well illustrates the difference in economic standing of the people of the United States and of the rest of world. While every American would rejoice to see all the other people of the world equally prosperous, it is certainly not human nature to expect our people to sacrifice what they have achieved simply to provide markets for products made abroad by people whose standards of living are now far below those prevailing here.

Probably every liberal-minded human being inherently feels that trade and commerce are great civilizing influences and that theoretically it would be better to have no restrictions of any kind. Like socialism free trade is the ideal thing in the abstract; but impracticable. We are faced with the necessity of protecting our prosperity with tariff barriers, or sinking back to the economic level of countries with medieval labor and living conditions.

One important fact in connection with a protective policy for our country has been given little prominence. In the last six years, during which we have enjoyed unprecedented prosperity, imports were valued at roughly $24,000,000,000 and exports at $26,000,000,000. On the face of these returns we were $2,000,000,000 "to the good." Actually, the $24,000,000,000 of imports, representing in most cases their *foreign valuation,* largely replaced goods that could they be produced in the United States, would have an American value of between $40,000,000,000 and $60,000,000,000. Generally the importer, not the consumer, profits from this difference in valuation.

Naturally, the too great exclusion of imports would seriously offset the purchasing power of many foreign countries, and the export business of automobile, radio and other manufacturers would be seriously hurt, causing disarrangement of our present industrial and economic structure. Also, of course, a considerable part of our imports are raw materials that cannot be produced in this country, although American ingenuity might find substitutes for them.

However, it is not beyond the realms of possibility that through the use of these odd billions spent abroad for foreign manufactured products at home the buying power of our own citizens might be so increased as to absorb the automobiles and radios now shipped abroad—or at least our people would have a chance to spend more of that money in foreign travel, for their own cultural benefit and the financial benefit of our foreign competitors.

In other words, this country might possibly be better off, as a whole, in an economic sense, if it had tariff walls so high as to exclude every commodity in the world which is or could be produced here, and thus confine its efforts to supplying the wants and needs of its own citizens. This is not an argument in favor of such tariff protection for there are humanitarian considerations, and considerations of statesmanship which transcend those concerning merely the material welfare of the American people; but it is well to keep in mind that instead, as some of our foreign competitors would have us believe, of being monuments of selfishness in seeking fair tariff protection, we may really be deserving of a reputation for generosity for allowing any replaceable foreign commodities at all to come in.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	8-28-29	92	94	
Alpha P. C. new com	8-26-29	44	46	75c qu. July 15
Alpha P. C. pfd	8-26-29	116	.....	1.75 Sept. 14
American Aggregates com.[29]	8-28-29	.....	44	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	8-26-29	95	.....	
American Brick Co., sand-lime brick	8-26-29	14	16	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	8-26-29	.....	80	50c qu. Aug. 1
Am. L. & S. 1st 7's[29]	8-28-29	96	98	
American Silica Corp. 6½'s[49]	8-27-29	96	100	
Arundel Corp. new com	8-26-29	43⅞	44	50c qu. July 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	8-27-29	80	90	
Atlas P. C. com	8-26-29	47	49	50c qu. Sept. 3
Beaver P. C. 1st 7's[20]	8-23-29	98	101	
Bessemer L. & C. Class A[4]	8-26-29	34	34½	75c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	8-26-29	93	96	
Bloomington Limestone 6's[29]	8-28-29	88	90	
Boston S. & G. new com.[16]	8-24-29	20	23	40c qu. July 1
Boston S. & G. new 7% pfd.[16]	8-24-29	50	52	87½c qu. July 1
Calaveras Cement 7% pfd	8-24-29	89	.....	
Calaveras Cement com	8-24-29	19	20⅜	
Canada Cement com	8-26-29	28	29	
Canada Cement pfd	8-26-29	97	98½	1.62½ qu. Sept. 30
Canada Cement 5½'s[11]	8-23-29	97½	99	
Canada Cr. St. Corp. 1st 6½'s[32]	8-22-29	97	98	
Canada Gyp. & Alabastine	8-26-29	125	127	75c qu. July 2
Can. Gyp. & Alabastine (new)	8-26-29	31¾	31⅞	
Certainteed Prod. com	8-26-29	29	29½	
Certainteed Prod. pfd	8-26-29	73	90	1.75 qu. Jan. 1
Cleveland Quarries new st'k	8-26-29	70	.....	50c&25c ex. Sept.1
Columbia S. & G. pfd	8-26-29	87½	91	
Consol. Cement 1st 6½'s, A[42]	8-27-29	90	92	
Consol. Cement 6½% notes[24]	8-28-29	85	95	
Consol. Cement pfd.[29]	8-28-29	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	8-12-29	101	103	
Consol. Rock Prod. com.[20]	8-23-29	8	9	
Consol. Rock Prod. pfd.[20]	8-23-29	.....	23	
Consol. Rock Prods. units[20]	7-27-29	52	53	
Consol. S. & G. com.(Can.)[43]	8-26-29	No market		
Consol. S. & G. pfd. (Can.)	8-26-29	91½	92	1.75 qu. Aug. 15
Construction Mat. com	8-26-29	24	24½	
Construction Mat. pfd	8-26-29	42	42⅜	87½c qu. Aug. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	8-23-29	.....	98½	
Coosa P. C. 1st 6's[29]	8-28-29	50	60	
Coplay Cem. Mfg. 1st 6's[40]	8-24-29	90	.....	
Coplay Cem. Mfg. com.[40]	8-24-29	10	.....	
Coplay Cem. Mfg. pfd.[40]	8-24-29	70	.....	
Dewey P. C. 6's[30] (1930-41)	8-27-29	96½	.....	
Dewey P. C. 6's[30] (1942)	8-27-29	102½	.....	
Dolese & Shepard	8-26-29	105	115	$2 qu. July 1
Edison P. C. com.[39]	7-26-29	10c	.....	
Edison P. C. pfd.[39]	7-26-29	25c	.....	
Giant P. C. com.[25]	8-22-29	26	36	
Giant P. C. pfd.[25]	8-22-29	29	36	3½% s.-a. June 15
Ideal Cement, new com	8-26-29	82	85	75c qu. July 1
Ideal Cement 5's, 1943[33]	8-24-29	98	100	
Indiana Limestone units[29] (5 shs. com. & 1 sh. pfd.)	8-28-29	No market		
Indiana Limestone 6's	8-22-29	80	84	
International Cem. com	8-26-29	71	72¾	$1 qu. June 28
International Cem. bonds 5's	8-26-29	100	100⅝	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	8-22-29	90	95	
Kelley Is. L. & T. new st'k	8-26-29	50	55	62½c qu. July 1
Ky. Cons. St. com. Voting Trust Certif.[48]	8-22-29	13	14	
Ky. Cons. Stone 6½'s*[48]	8-22-29	96	100	
Ky. Cons. Stone pfd.[48]	8-22-29	90	95	
Ky. Cons. Stone com.[48]	8-22-29	13	14	
Lawrence P. C.	8-26-29	.....	80	2% qu. June 29
Lawrence P. C. 5½'s, 1942	8- 7-29	88	92	
Lehigh P. C.	8-26-29	45	47	62½c qu. Aug. 1
Lehigh P. C. pfd	8-26-29	109	109½	1¾% qu. Oct. 1
Louisville Cement	8-12-29	250	.....	
Lyman-Richey 1st 6's, 1932[13]	8-24-29	97	99	
Lyman-Richey 1st 6's, 1935[13]	8-24-29	96	98	
Marblehead Lime 6's[14]	8-23-29	95	100	
Material Service Corp.	8-26-29	29	29⅞	50c qu. Sept. 1
Medusa Portland Cem.[29]	8-28-29	120	125	1.50 July 1
Mich. L. & C. com.[6]	8-24-29	35	.....	
Missouri P. C.	8-26-29	42	42¾	50c qu. Aug. 1
Monolith Midwest[9]	8-22-29	8½	10	
Monolith bonds, 6's[9]	8-22-29	97	98	
Monolith P. C. com.[9]	8-22-29	14	14½	40c s.-a. July 1
Monolith P. C. pfd.[9]	8-22-29	9	9½	40c s.-a. July 1
Monolith P. C. units[9]	8-22-29	32	33½	
National Cem. (Can.) 1st 7's[29]	8-28-29	97	100	
National Gypsum A com	8-26-29	12½	13½	
National Gypsum pfd	8-26-29	54	58	
Nazareth Cem. com.[26]	8-10-29	27	29	
Nazareth Cem. pfd.[26]	8-10-29	100	105	
Newaygo P. C. 1st 6½'s[29]	8-28-29	102	102½	
New Eng. Lime 1st 6's[14]	8-23-29	95	100	
N. Y. Trap Rock 1st 6's	8-26-29	98	.....	
North Amer. Cem. 1st 6½'s	8-26-29	70	.....	
North Amer. Cem. com.[22]	8-23-29	8	10	
North Amer. Cem. 7% pfd.[22]	8-23-29	38	45	1.75 qu. Aug. 1
North Amer. Cem. units[29]	8-28-29	.....	41	
North Shore Mat. 1st 5's[15]	8-27-29	96	.....	
Northwestern States P. C.[37]	7-26-29	140	.....	
Ohio River Sand com	8-26-29	28½	30	
Ohio River Sand 7% pfd	8-26-29	100	101	
Ohio River S. & G. 6's[16]	8-24-29	92	95	
Pac. Coast Agg. 6½'s	7-27-29	99	.....	
Pac. Coast Agg. 7's	7-27-29	99	.....	
Pac. Coast Cem. 6's, A[5]	8-22-29	.....	95	
Pacific Lime Co. pfd.[43]	8-26-29	No market		
Pacific P. C. com	8-22-29	22	25	
Pacific P. C. pfd	8-22-29	80	83	1.62½ qu. July 5
Pacific P. C. 6's[5]	8-22-29	99¼	100	
Peerless Egyp'n P. C. com.[21]	8-26-29	2½	3½	
Peerless Egyp'n P. C. pfd.[21]	8-26-29	85	100	1.75 July 1
Penn-Dixie Cem. 1st 6's	8-26-29	84½	85	
Penn-Dixie Cem. pfd	8-26-29	51	54½	1.75 qu. Sept. 15
Penn-Dixie Cem. com	8-26-29	10	10½	
Penn. Glass Sand Corp. 6's†	8- 7-29	98	101	
Penn. Glass Sand pfd	8- 7-29	115	.....	
Petoskey P. C.	8-26-29	9½	10½	1½% qu.
Riverside P. C. com.[5]	8-22-29	22	.....	
Riverside P. C. pfd.[9]	8-22-29	96	.....	1.50 qu. Aug. 1
Riverside P. C., A[9]	8-22-29	16	18	31¼c qu. Aug. 1
Riverside P. C., B[9]	8-22-29	5	.....	
Santa Cruz P.C. 1st 6's, 1945	8-22-29	108½	.....	6% annual
Santa Cruz P. C. com	8-22-29	95	.....	$1 qu. July 1
Schumacher Wallboard com	8-24-29	15	16½	
Schumacher Wallboard pfd	8-24-29	23½	25	50c qu. Aug. 15
Southwestern P. C. units[44]	8-10-29	270	.....	
Standard Paving & Mat. (Can.) com	8-26-29	34	34¼	50c qu. Aug. 15
Standard Pav. & Mat. pfd	8-26-29	.....	96	1.75 qu. Aug. 15
Superior P. C., A[20]	8-23-29	43	44	27½c mo. Sept. 1
Superior P. C., B[20]	8-23-29	24¾	25	
Trinity P. C. units[37]	7-26-29	142	150	
Trinity P. C. com.[37]	7-26-29	51	.....	
Trinity P. C. pfd.[29]	8-28-29	110	115	
U. S. Gypsum com	8-26-29	74¾	75½	2% qu. Sept. 30
U. S. Gypsum pt. paid	8-26-29	69	71	
U. S. Gypsum pfd.[29]	8-28-29	125	127	1¾% qu. Sept. 30
Universal G. & L. com.[3]	8-27-29	50c	1½	
Universal G. & L. pfd.[3]	8-27-29	8	12	
Universal G. & L., V.T.C.[3]	8-27-29	No market		
Universal G. & L. 1st 6's[3]	8-27-29	60	.....	
Warner Co. com.[16]	8-24-29	48½	50	50c qu. July 15
Warner Co. 1st 7% pfd.[16]	8-24-29	100	.....	1¾% qu. July 1
Warner Co. 1st 6's[8]	8-27-29	98	99	
Whitehall Cem. Mfg. com.[36]	7-30-29	125	.....	
Whitehall Cem. Mfg. pfd.[36]	7-30-29	50	.....	
Wisconsin L. & C. 1st 6's[15]	8-27-29	97	.....	
Wolverine P. C. com	8-26-29	5	5½	15c qu. Aug. 15
Yosemite P. C., A com.[20]	8-23-29	4¼	4¾	

*Ann. interest due May and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1. †Called for redemption at 105, July 1.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler Beadling & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Dillon, Read & Co., Chicago, Ill. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Peters Trust Co., Omaha, Neb. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co., of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Hemphill, Noyes & Co., New York City, N. Y. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]A. E. Ames & Co., Toronto, Can. [33]Boettcher Newton & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Inc., Los Angeles, Calif. [45]Taylor Ewart & Co. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd. (sand-lime brick) 13 sh.[6]	par 25	24
American Brick Co. pfd., 5 sh.[2] (par 25)	25	.....
Atlantic Gypsum Products[6] com., 200. shares	$2 per share	.....
International Portland Cement Co., Ltd., pfd	30	45
Rockland & Rockport Lime Co. 2nd pfd.[7] 13½ sh.	2⅞ per share	.....
Rockland & Rockport Lime Co. com.[7] 14½ sh.	55c per share	.....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	.....

Stock	Price bid	Price asked
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Rock Brick Co., pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price at auction by R. L. Day & Co., April 24, 1929. [6]Price obtained at auction by Wise and Arnold, Boston, Mass., June 19, 1929. [7]Price obtained at auction by R. L. Day & Co., August 21, 1929.

U. S. Gypsum Earnings

CONTINUED severe competition in the gypsum industry and the consequent drastic reductions in prices are reflected in the report of the United States Gypsum Co. and subsidiaries for the six months ended June 30. The statement shows a net profit of $2,329,244 after depreciation, depletion, federal taxes and all other charges, equal after preferred dividends to $2.70 a share earned $15,300,540 of $20 par common stock, as against $3,334,487, or $4.43 a share on $13,830,040 of common stock, in the corresponding period of last year.

A comparison of the consolidated income account for the six months, June 30, follows:

UNITED STATES GYPSUM CO. AND SUBSIDIARY COMPANIES—SUMMARY OF CONSOLIDATED SURPLUS ACCOUNT

	6 mo. period ended 1929	1928
Net profits before deducting depreciation, depletion and federal income taxes	$3,258,662.90	$4,389,575.97
Deduct provisions for:		
Depreciat'n and depl'n	666,363.25	618,085.86
Federal income taxes	263,055.81	437,003.79
Total	$ 929,419.06	$1,055,089.65
Surplus net profits	$2,329,243.84	$3,334,487.32
Surplus resulting from issuance of capital stock	184,704.21	29,670.00
Gross increase in surplus	2,513,948.05	3,364,157.32
Deduct cash dividends paid	875,068.76	824,345.84
Net increase in surplus	$1,638,879.29	$2,539,811.48
Net income on common stock, per share	$ 2.70	$ 4.43

COMPARATIVE CONSOLIDATED BALANCE SHEETS

Assets	June 30, 1929	June 30, 1928
Current Assets:		
Cash on hand and in banks	$ 684,206.43	$ 767,671.41
U. S. government securities	6,479,899.44	7,298,260.07
Accounts and notes receivable	4,753,762.80	5,581,223.56
Construction contracts receivable	545,687.78	404,556.96
Inventories	3,081,737.43	2,936,891.55
Total	$15,545,293.88	$16,988,603.55
Stock subscriptions receivable, investments, etc.:		
Stock subscriptions	$ 3,000,388.02	
Bonds and other securities	208,127.17	$ 176,983.90
Total	$ 3,208,515.19	$ 176,983.90
Plant and equipment	$53,565,001.63	$41,371,474.18
Deferred charges	$ 984,605.33	$ 730,769.37
Total assets	$73,303,416.03	$59,267,831.00
Liabilities		
Current liabilities:		
Notes payable	$ 1,600,000.00	
Accounts payable	1,059,260.47	$ 702,453.08
Accrued liabilities	1,357,335.64	1,527,730.48
Total	$ 4,016,596.11	$ 2,230,183.56
Reserves	$10,008,746.93	$ 8,592,876.93
Capital stock and surplus:		
Preferred stock	$ 7,541,700.00	$ 7,841,700.00
Common stock outstanding	15,300,540.00	13,830,040.00
Common stock subscribed	7,603,680.00	
Surplus	28,832,152.99	26,773,030.51
Net worth	$59,278,072.99	$48,444,770.51
Total liabilities	$73,303,416.03	$59,267,831.00
Net working capital	$11,528,697.77	$14,758,419.99

Conditions have taken a turn for the better, and more favorable prices are expected, according to Sewell L. Avery, president, in his letter to stockholders.

"While statistics indicate some decline in building, a satisfactory output seems probable for the remainder of the year," Mr. Avery states. 'The new Boston mill has been in operation since April. The Chicago mill started late in July. The Philadelphia plant will operate August 15, and the Detroit mill is expected to go into production September 1. Observation of the new plants now running indicates clearly that they will justify the expectations in service and economy for which they are designed."

Canada Gypsum Splits Common on 4 to 1 Basis

STOCKHOLDERS of Canada Gypsum and Alabastine, Ltd., Paris, Ont., at a recent special meeting approved a split-up in the existing common stock on a four to one basis. The dividend rate of the new stock has not yet been decided on but it is believed that there will be a substantial increase over the current rate of $3 per year on the present shares.

A year ago last March the shareholders were given the right to subscribe for two new shares at $40 for every five shares held at that time. The proceeds of the 21,000 shares so issued and taken from the treasury were utilized for the purchase of additional properties, thus materially extending the scope of the company's operations. Earnings presently are running at the rate of $10 per share; last year they were on a basis of $6.45 per share of common.

The outstanding debentures have been redeemed in full. Of the $1,000,000 six percent debentures previous outstanding, about $750,000 were exchanged for common stock of the company on the basis of 10 common shares of no par value for every $1000 debenture. The balance was paid off in cash. This combined conversion and redemption has the effect of reducing the company's outstanding funded debt from $3,500,00 to $2,437,000.

Canada Gypsum this year decided to go into the lime business on a much larger scale than formerly and accordingly purchased outright the following properties in Ontario: Beachville Lime and Stone, Beachville; D. Robertson and Co., Milton; Christie, Henderson and Co., Hespeler, Puslinch and Kelso; Toronto Lime Co., Limehouse; Wellington Lime Co., Toronto; and a limestone deposit at Mille Roches, near Cornwall, Ont. (See ROCK PRODUCTS, August 3, 1929.) With the acquisition of these properties and the lime property at Elora already owned, the company practically controls the total lime business in Ontario with the exception of the Standard White Lime Co. at Guelph. Recently the Canada company acquired the Standard Lime Co., Ltd., Joliette, Que., and its affiliated sand and sand-lime brick operations (ROCK PRODUCTS, August 17, 1929). An extension of its lime business to Manitoba and far western Canada is reported under consideration.

Sales results for the seven months ending July 31, not including sales of the company's recent acquisition, Standard Lime, Ltd., showed an increase in excess of 30% over those for the same period of last year and sales for the month of July on the same basis showed an increase of approximately 40% over those for July of last year.

The original predecessor company, the Alabastine Co. of Paris, Ont., was formed in 1886 with a paid-up capital of $34,000. Since that time, with the accumulating prestige of other companies acquired, it has grown to the present nation-wide organization, having a paid-up share and loan capital and surplus of nearly $9,000,000 and having as current market value for its outstanding securities over $13,000,000. Its sales have risen from $30,000 per annum in 1886 to well over $4,000,000 per annum in 1928. An investment of $100 in the original capitalization of the Alabastine company is worth at current market prices, including stock dividends paid to shareholders, over $6,000. The original company confined itself entirely to the manufacture of alabastine; the present company operates alabastine, gypsum and lime plants, quarries and plants and a sand-lime brick plant.

Warner Co. Stock Listed on Philadelphia Market

COMMON stock of the Warner Co. was recently admitted to trading in the unlisted department of the Philadelphia Stock Exchange. These shares are already listed on the New York Curb Market.

Arrangements for the unlisted trading will be only temporary as it is planned to admit the common shares of the company, as well as the preference stock and bonds, to the regular list in the near future.

The Warner Co. was organized early in 1929 to acquire the business and substantially all assets of the Charles Warner Co., and the Van Sciver Corp. The Charles Warner Co. was incorporated in 1885 and is a direct successor to a partnership established at Wilmington, Del., since 1794.

In 1924, the company acquired the Penn Sand & Gravel Co.; in 1925, the American Lime & Stone Co.; in 1926, the Henry E. Strathmann, Inc., and in 1927, absorbed the West Jersey Sand & Gravel Co., in which it had a substantial stock interest. Merger with the Van Sciver Corp., under the new corporate title took place early this year.

The company owns 2400 acres of land at Tullytown, near Bristol, which is estimated to contain 65,000,000 tons of marketable materials.

There are outstanding 203,000 common shares, of a total of 350,000 authorized. Recent bid and asked prices were given locally as 43 and 46.—*Philadelphia* (Penn.) *Record.*

Material Service Corporation Annual Report for 1928

THE FOLLOWING data are taken from the 1928 stockholders report of Henry Crown, president of the Materials Service Corp., concerning the operations of the company and its subsidiaries:

The year's business, both in gross earnings and net income, was the largest in the history of the company, the gross sales amounting to $10,030,522.96 as against $7,546,894.72 in the previous year.

In addition the year 1928 was marked by the acquisition of new dock properties for distributing yards, development of a promising gravel producing plant at Lockport, Ill., and a new silica sand producing plant at Ottawa, Ill., all of which additions will bring increased revenue for 1929.

The new South Chicago dock with the most advanced improvements and facilities for handling material will put the company in position to handle a large additional volume of business in a territory that was not previously covered.

The large Lockport sand and gravel plant which will be operating soon is the only plant in this district from which deliveries will be made by boat. The new self-unloading boat *Material Service*, which is so constructed as to pass under the closed bridges in the Chicago river, is practically ready now and its operation will effect a considerable saving in material costs. The Ottawa silica sand plant, which has a capacity of about 40 cars per day, is now completed and will also be a source of additional revenue not enjoyed in 1928.

The year 1928 was extremely competitive and 1929 expected to be more so. However, there has been already booked an attractive volume of business for 1929 and in view of the above mentioned advantages for increasing revenue it is believed that there will be some interesting information for the stockholders on the occasion of the next annual meeting and to those stockholders who have witnessed the continued growth year after year, the 1929 statement should be quite pleasing.

MATERIAL SERVICE CORP.—ANALYSIS OF BALANCE SHEETS

	Dec. 31, 1927	Dec. 31, 1928	Increase
Current assets	$1,083,878	$1,513,004	$ 429,126
Current liabilities	787,545	301,459	*486,086
Working capital	$ 296,333	$1,211,545	$ 915,212
Other assets	195,857	168,103	*27,754
Fixed assets (net)	1,699,546	2,073,921	374,375
Goodwill	1	1	.....
Total	$2,191,737	$3,453,570	$1,261,833
Other liabilities	172,500	67,500	105,000
Net worth	$2,019,237	$3,386,070	$1,366,833
Net worth per share of stock now outstanding	$16.15	$27.09	$10.94

*Decrease.

ANALYSIS OF PROFIT AND LOSS

	1927	1928	Increase
Gross sales	$7,511,028	$10,030,523	$2,519,495—33.6%
Net profit (after depreciation, depletion and federal income taxes)	410,330	534,322	123,992—30.24%
Net profit per share of stock now outstanding	3.24	4.27	1.03

MATERIAL SERVICE CORP. AND SUBSIDIARY COMPANIES—CONSOLIDATED BALANCE SHEET
(December 31, 1928)

ASSETS

Current assets:		
Cash on hand and in banks	$	115,137.58
Receivables—Less reserves		1,099,496.54
Inventories, cost or market, whichever lower		207,818.98
Advances for material and services		87,289.56
Prepaid expenses		3,261.74
Total current assets		$1,513,004.40
Other assets:		
Officers, stockholders and employes accounts, cash surrender value of officers' life insurance, securities, etc.		168,103.13
Fixed assets: (See Note)		
Buildings, equipment and deposits—Less reserve for depreciation and depletion	$	986,551.54
Land		1,087,369.77
		$2,073,921.31
Note—Properties include $680,727.59 carried at cost. Balance were appraised as of December 31, 1927, by American Appraisal Co.		
Goodwill		$1.00
		$3,755,029.84

LIABILITIES AND NET WORTH

Current liabilities:		
Trade creditors and other payables	$	91,948.58
Notes receivable discounted		35,000.00
Accrued expenses, including reserve for federal taxes		174,510.96
Total current liabilities	$	301,459.54
Purchase money obligations:		
Maturing in 1930-1932		57,500.00
Minority stockholders' interest		10,000.00
Net worth:		
Capital stock—Authorized and outstanding, 125,000 shares, par value $10		$1,250,000.00
Capital surplus		789,446.13
Earned surplus		1,346,624.17
		$3,386,070.30
		$3,755,029.84

Monolith Portland Bonds Offered

CALIFORNIA CO., Los Angeles, Calif., is offering at 98 and accrued interest (to yield over 6.25%) $1,000,000 of Monolith Portland Cement Co. 6% sinking fund gold bonds due January 1, 1939. The following data are taken from a letter of Coy Burnett, president of the Monolith company:

HISTORY AND BUSINESS—The company was incorporated under the laws of Nevada, June 30, 1920, and has successfully engaged in the production and sale of portland cement. From an initial production of approximately 800 bbl. per day, production has increased until at the present time it is in excess of 4000 bbl. The trade name is known as "Monolith," and in addition to the regular "Monolith" portland cement manufactured the company has built up and successfully marketed on the entire Pacific coast a specialty trade named "Monolith Plastic Waterproof Cement." "Monolith Plastic" has proved to be one of the most noteworthy advances in building materials in recent years.

Net sales of "Monolith Portland" and "Monolith Plastic" since 1921 to 1928, inclusive, have increased from $742,082 to $2,628,459, equivalent to an average annual increase over 1921 of 30%. The annual maximum production capacity at the present time is approximately 1,600,000 bbl. This can be doubled with a comparatively small outlay of additional capital. The growth and development of the company since its incorporation has to a great extent been due to the loyalty and efficiency of our staff and to the reinvestment of earnings in the company.

The Monolith Portland Midwest Co. will become a subsidiary of Monolith Portland Cement Co., as all of the outstanding common stock will be owned by the parent company. The "Monolith Midwest Co." plant located at Laramie, Wyo., is one of the most modern wet process plants in the United States, having been designed and built entirely under the direction of F. L. Smidth and Co., by Macdonald Engineering Co., at a cost in excess of $2,000,000. Its production capacity will be between 1800 and 2200 bbl. per day. A cement deposit consisting of 2950 acres at this location is owned by the "Midwest company" and has been appraised by the General Appraisal Co. as having a value of $5,026,250.

A condensed balance sheet of this company as at November 30, 1928, as prepared by Messrs. Arthur Andersen and Co., follows:

ASSETS

Current assets:		
Cash	$	94,696.49
Stock subscriptions receivable and accrued interest		474,963.61
	$	569,660.10
Advances to affiliated interests—not current		32,916.11
Plant and property		1,788,065.65
Limestone deposits		5,026,322.66
Capital stock selling expenses		385,486.04
		$7,802,450.56

LIABILITIES AND CAPITAL

Current liabilities	$	598,820.49
Capital stock:		
Preferred stock, par $10 each		
Issued & outstanding, 172,605 sh.		$1,726,050.00
Subscribed but unissued, 60,635 sh.		606,350.00
		$2,332,400.00
Common stock, no par value—Issued and outstanding, 300,000 shares, assigned value		$4,871,230.07
		$7,802,450.56

Sale of preferred stock at par is being continued, which contemplates adequate financing of the company, including working capital.

CAPITALIZATION
(Upon completion of the present financing)

	Authorized	To be outstanding
First mortgage sinking fund 6% gold bonds	$1,000,000	$1,000,000
8% cumulative preferred stock	1,500,000	1,500,000
Common stock (no par), shs.	250,000*	225,000

*25,000 shares reserved for exercise of warrants attaching to first mortgage 6% sinking fund gold bonds.

PROPERTIES—The Monolith Portland Cement Co. plant is located at Monolith, Kern county, California, on the Southern Pacific and Santa Fe joint right of way. This location is ideal not alone for its proximity to raw materials, but also its availability to the centers of consumption. The developed and proven raw material resources controlled at this location are estimated as having a tonnage sufficient to supply the plant at double its present rate of consumption for more than 100 years. The plant is of modern up-to-date type, operating under the wet process, four kilns of 200 ft. length.

EARNINGS—Net earnings as certified by Messrs. Arthur Anderson and Co., certified public accountants, after all charges except federal income taxes, including depreciation on cost values, available for interest requirements on the first mortgage 6% sinking fund gold bonds to be outstanding, for the four years and 11 months ended November 30, 1928, have been as follows:

		Times Interest earned
1924	$299,645	4.99
1925	504,494	8.40
1926	334,387	5.57
1927	416,743	6.94
1928	407,091*	7.40

*Eleven months ended November 30, 1928.

MONOLITH PORTLAND CEMENT CO.—BALANCE SHEET, NOVEMBER 30, 1928

[Giving effect as of that date to the following contemplated transactions: (1) The sale for cash of $1,000,000 par value first mortgage 6% gold bonds; (2) The appropriating of the proceeds in part for payment of bank loans; (3) The recapitalization of the company to include 250,000 shares no par value common stock; (4) The issuance of no par value common stock as follows: (a) 150,000 shares for 150,000 shares $10 par value common stock previously outstanding; (b) 75,000 shares for 100% of common stock of Monolith Midwest Co.]

ASSETS

Current assets:			
Cash in banks and on hand		$ 776,393.92	
Receivables, less reserves—			
Trade acceptances and accounts	$147,121.26		
Due from affiliated interests ($149.-153.20 paid in December, 1928, and January, 1929—balance payable within one year)	244,735.76		
Employes' and sundry accounts	8,922.40	400,779.42	
Inventories at cost—not in excess of market		237,055.16	$1,414,228.50
Advances and investments not current:			
Advances to stockholders and others		$ 140,474.49	
Investment in Monolith Midwest Co.—300,000 shares no par value common stock		1,143,750.00	1,284,224.49
Deferred charges			128,200.04
Land, buildings, equipment, etc.:			
Stated at sound values as appraised by General Appraisal Co. at July 28, 1927, plus subsequent additions at cost less depreciation accrued to November 30, 1928—			
Land		$ 90,540.00	
Plant and equipment	$2,847,024.35		
Less reserves for depreciation	291,945.47	2,555,078.88	2,645,618.88
Leasehold on land containing limestone deposits—Expiring October 21, 2025			
Stated at value determined by General Appraisal Co. at July 28, 1927—in process of amortization			2,670,170.07
Patents and goodwill—at nominal value			1.00
			$8,142,442.98

LIABILITIES AND NET WORTH

Current liabilities:			
Accounts payable		$ 308,566.60	
Accrued liabilities		41,962.54	
Provision for federal income taxes		65,708.69	$ 416,237.83
Contingent liabilities:			
On trade acceptances receivable discounted	$ 18,375.09		
As endorser for notes and trade acceptances of Monolith Portland Midwest Co.	225,764.43		
On contract for sale of cement subject to interpretation resulting in possible liability of	97,900.00		
First mortgage 6% sinking fund gold bonds due January 1, 1939			1,000,000.00
Net worth:			
Capital stock—			
8% cumulative preferred—(Dividends cumulative from July 1, 1928)—			
Authorized and issued 150,000 shares, par value $10 each	$1,500,000.00		
Less 277 shares held in treasury	2,770.00	1,497,230.00	
No par value common—			
Authorized 250,000 sh. (See Note)			
Issued, 225,000 shares, stated value $10 each	$2,250,000.00		
Less 232 shares held in treasury	2,320.00	2,247,680.00	
Total		$3,744,910.00	
Paid-in surplus		393,750.00	
Surplus arising from appraisal of plant and property and valuation of leasehold—			
Plant and property	$ 390,328.55		
Leasehold	1,755,706.76	2,146,035.31	
Earned surplus		441,509.84	6,726,205.15
			$8,142,442.98

Note—25,000 shares of no par value common stock are reserved for purchase warrants attached to first mortgage bonds at the rate of 25 shares for each $1,000 bond at $20 per share.

The total earnings for the above period are subject to possible reduction in the sum of $61,400, pending interpretation of certain sales contract.

The average earnings as indicated above are equivalent to 6.65 times maximum interest requirements on bonds oustanding.

ASSETS—The balance sheet as of November 30, 1928, as certified by Messrs. Arthur Andersen and Co., certified public accountants, after giving effect to this financing shows total net assets of $7,598,004.11, which includes leasehold value of $2,670,-170.07, or net tangible assets of $4,927,834.04, equivalent to $4927 for each $1000 par value first mortgage 6% sinking fund gold bonds to be outstanding. Current assets are shown as $1,414,228.50 against current liabilities of $416,237.83, or a ratio of 3.40 times to one.

PURPOSE—The proceeds of this present financing will be used for liquidation of bank loans and other corporate purposes.

WARRANTS—Each bond shall bear a detachable stock purchase warrant entitling the bearer at any time on or before January 1, 1939, to purchase 25 shares of the common stock of the Monolith Portland Cement Co. at $20 per share. In the event, however, through the operation of the sinking fund, or call by the company, that all bonds of this mortgage are retired, then the stock purchase warrants shall expire upon the date of redemption of the last bonds.

Penn.-Dixie Earnings

THE recent earnings statement of the Pennsylvania-Dixie Cement Corp. for the 12months ended June 30 showed the preferred dividend barely earned in that period. However, the usual quarterly dividend of $1.75 per share on the preferred stock was voted, a feature in keeping with what is understood to be the desire of the majority of the directorate to maintain the dividend just as long as earnings cover its requirements.

In common with other of the large cement companies Penn.-Dixie has suffered keenly during the past two and a half years from the importation of foreign cement, mainly from Belgium. Its mills located on the Atlantic Seaboard have not been profitable for some time. Other mills located inland, however, have shown earnings sufficient to cover both preferred dividend and interest charges, with a slight margin besides.

Earnings have declined from $2.64 a common share in 1927 to 90c. a common share for the year ended December 31, 1928, and the recent statement shows a further slump to $7.18 a preferred share for the 12 months ended June 30, 1929. The sharp decline in net since the beginning of this year is attributed to further price reductions in the Southeast, where 40% of Penn.-Dixie producing capacity is located.

There have been reductions totalling 50c. a barrel in the Southern territory within the past year. This necessitated the closing of the Penn-Dixie mill in Tennessee, which had operated continuously for the past 17 years. Recently the International Cement Corp. closed its comparatively new mill at Norfolk, Va., for an indefinite period, and gave as the reason the inability of the company to compete with Belgian cement, with its low production and labor costs. (ROCK PRODUCTS, August 17, p. 76). There is now before the special Congressional session for consideration a tariff schedule on cement which if enacted would be of considerable aid to the domestic manufacturers. Up to the present leaders in Congress have given no indication of what the ultimate disposal of this item in the tariff bill will be.

Penn.-Dixie Cement is in good financial position as the common dividend was first reduced and then passed in October, 1928, to prevent impairment of its financial position. Cash on hand on June 30 amounted to $1,402,000 and was substantially in excess of all current liabilities. The capitalization of the company consists of $11,792,000 in funded debt, 135,888 shares preferred and 400,000 common stock.—*Wall Street News.*

Rhodes-Jamieson Bonds Retired

RHODES-JAMIESON CO., Oakland, Calif., has announced retirement of its entire outstanding bonded indebtedness, aggregating about $340,000 at a premium of 2½%, on September 1, 1929. The bonds outstanding are first closed mortgage 7% serial issue, of $1,000 and $500 denominations. The American Trust Co. is trustee. The company, which recently became a unit of Pacific Coast Aggregates, Inc., had $575,000 7% cumulative preferred and $1,000,000 common outstanding.—*Wall Street Journal.*

Recent Dividends Announced

Alpha P. C. pfd. (qu.)	1¾%, Sept. 14
American Brick (sand-lime brick) pfd. (qu.)	50c, Aug. 1
Atlas P. C. (qu.)	50c, Sept. 3
Cleveland Quarries ext. div.	25c, Sept. 1
Consumers Co. pr. pfd. (qu.)	1½%, Oct. 1
Indiana Limestone pfd. (qu.)	$1.75, Sept. 1
International Cement (qu.)	$1, Sept. 27
Lehigh P. C. Co. pfd. (qu.)	1¾%, Oct. 1
Penn.-Dixie Cement pfd. (qu.)	$1.75, Sept. 15
Schumacher Wallboard pfd. (qu.)	50c, Aug. 15
Stand. Pav. & Mat. (Can.) com. (qu.)	50c, Aug. 15
Stand. Pav. & Mat. (Can.) pfd. (qu.)	1¾%, Aug. 15
U. S. Asbestos com (qu.)	75c, Aug. 1
U. S. Gypsum com. (qu.)	40c, Sept. 30
U. S. Gypsum pfd. (qu.)	1¾%, Sept. 30

Portland Cement Output in July

Production Decreases 1½%, Shipments Increase 1.9% and Stocks Are 7.9% Higher Than in Like Period in 1928

THE portland cement industry in July, 1929, produced 17,216,000 bbl., shipped 20,273,000 bbl. from the mills and had in stock at the end of the month 24,372,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in July, 1929, showed a decrease of 1.5% and shipments an increase of 1.9% as compared with July, 1928. Portland cement stocks at the mills were 7.9% higher than a year ago.

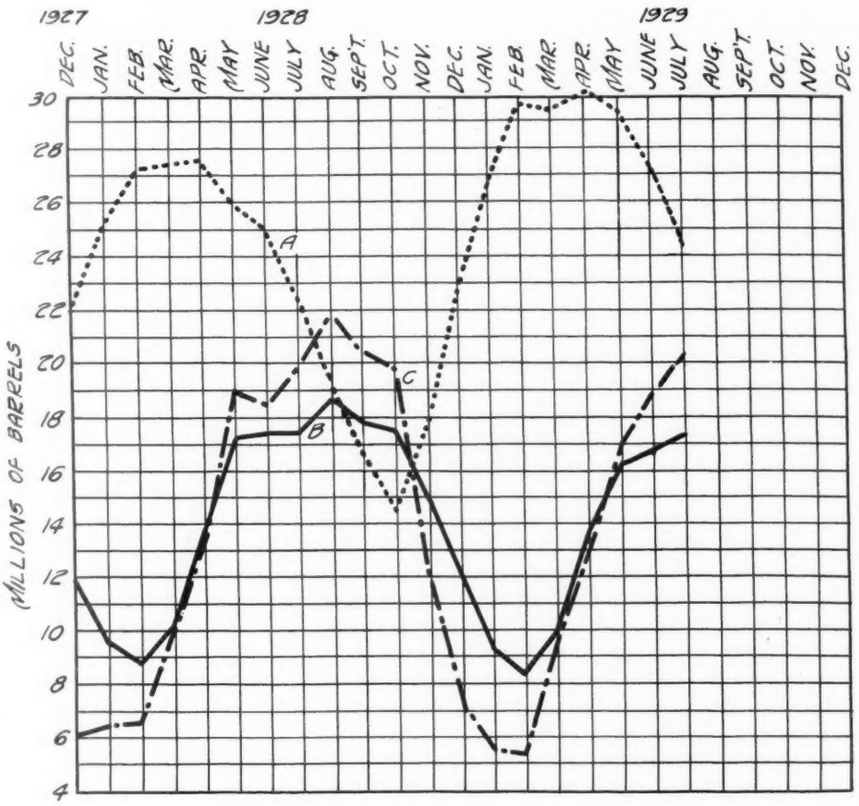
The statistics here presented are compiled from reports for July from all manufacturing plants except two, for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 163 plants at the close of July, 1929, and of 158 plants at the close of July, 1928. In addition to the capacity of the new plants which began operating during the 12 months ended July 31, 1929, the estimates include increased capacity due to extensions and improvements at old plants.

RELATION OF PRODUCTION TO CAPACITY

	July 1928 Pct.	July 1929 Pct.	June 1929 Pct.	May 1929 Pct.	Apr. 1929 Pct.
The month	87.0	80.4	80.9	76.4	67.1
12 months ended	73.7	68.9	69.0	70.2	71.1

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during May and June, 1928 and 1929:


1927
1928
1929
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEP'T. OCT. NOV. DEC.
MILLIONS OF BARRELS
30 28 26 24 22 20 18 16 14 12 10 8 6 4
A
B
C

(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN MAY AND JUNE, 1928 AND 1929, IN BARRELS*

Shipped to	1928—May	1929†	1928—June	1929
Alabama	294,946	172,938	218,443	156,187
Alaska	588	1,641	1,179	1,564
Arizona	23,982	57,318	45,357	76,157
Arkansas	120,605	98,331	94,530	148,867
California	1,101,338	977,113	1,135,923	981,611
Colorado	122,205	106,513	134,040	105,289
Connecticut	273,367	202,140	274,577	192,236
Delaware	35,361	35,091	31,076	45,544
District of Columbia	66,508	109,581	77,565	110,735
Florida	90,435	105,045	101,132	91,891
Georgia	167,422	121,684	151,318	117,598
Hawaii	29,807	32,262	19,441	22,254
Idaho	35,009	35,169	31,940	31,802
Illinois	2,087,924	1,583,290	1,921,820	1,780,688
Indiana	568,668	474,599	513,118	635,341
Iowa	929,356	579,190	790,414	728,393
Kansas	250,076	258,378	203,747	229,267
Kentucky	178,020	146,423	155,438	164,656
Louisiana	110,257	121,576	107,624	111,922
Maine	49,458	56,851	69,190	65,594
Maryland	250,926	235,589	240,228	244,635
Massachusetts	306,685	303,692	314,595	293,455
Michigan	1,218,783	1,192,634	1,393,059	1,486,439
Minnesota	446,443	348,850	490,086	456,148
Mississippi	89,421	79,718	90,654	73,313
Missouri	473,066	436,246	388,090	567,722
Montana	50,054	76,909	57,263	82,861
Nebraska	131,720	140,036	132,088	152,570
Nevada	11,050	16,672	10,583	14,091
New Hampshire	48,034	70,122	52,334	73,359
New Jersey	899,439	890,487	836,204	909,551
New Mexico	30,612	28,894	32,989	32,003
New York	2,414,892	2,130,573	2,369,486	2,493,401
North Carolina	259,658	222,453	253,034	179,570
North Dakota	69,986	58,414	89,107	81,746
Ohio	1,263,450	990,025	1,111,149	1,192,848
Oklahoma	307,249	270,643	271,078	286,697
Oregon	143,000	94,249	132,565	95,717
Pennsylvania	1,396,046	1,296,266	1,303,841	1,467,886
Porto Rico	500	300	.....	2,800
Rhode Island	93,304	80,975	81,651	72,067
South Carolina	141,083	139,561	174,819	123,954
South Dakota	65,137	54,123	81,989	64,846
Tennessee	274,229	248,286	231,638	348,983
Texas	601,278	622,377	563,118	675,511
Utah	38,520	67,602	50,931	59,003
Vermont	43,912	83,862	67,482	130,517
Virginia	201,315	190,663	198,998	186,036
Washington	315,209	208,716	342,740	244,546
West Virginia	151,015	115,718	126,545	153,996
Wisconsin	615,376	633,405	728,674	786,307
Wyoming	18,033	20,364	22,174	27,961
Unspecified	27,702	0	36,666	14,081
	18,932,459	16,623,557	18,353,730	18,872,216
Foreign countries	53,541	82,443	67,270	69,784
Total shipped from cement plants	18,986,000	16,706,000	18,421,000	18,942,000

*Includes estimated distribution of shipments from three plants each month
†Revised.

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1928 AND 1929, IN BARRELS

Month	1928—Production	1929	Stocks at end of month 1928	1929
January	11,839,000	12,041,000	9,672,000	9,642,000
February	11,363,000	11,255,000	12,237,000	12,436,000
March	12,501,000	12,450,000	14,463,000	14,948,000
April	13,844,000	14,166,000	15,002,000	15,472,000
May	16,025,000	15,445,000	14,329,000	14,910,000
June	15,940,000	15,283,000	12,944,000	13,573,000
July	15,981,000	15,120,000	11,707,000	11,607,000
August	16,202,000	.....	9,357,000	.....
September	15,909,000	.....	7,566,000	.....
October	15,782,000	.....	5,944,000	.....
November	14,930,000	.....	5,953,000	.....
December	13,426,000	.....	7,422,000	.....

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JULY, 1928 AND 1929, AND STOCKS IN JUNE, 1929, IN BARRELS

District	Production 1928—July—1929		Shipments 1928—July—1929		Stocks at end of month 1928	1929	Stocks at end of June, 1929*
East'n Penn., N. J. and Md.	3,832,000	3,709,000	4,042,000	4,171,000	5,913,000	5,389,000	5,852,000
New York and Maine	1,207,000	1,366,000	1,428,000	1,609,000	1,622,000	1,766,000	2,009,000
Ohio, West'n Penn., W. Va.	1,843,000	2,075,000	2,172,000	2,246,000	3,096,000	3,378,000	3,550,000
Michigan	1,662,000	1,432,000	1,872,000	1,964,000	1,748,000	1,937,000	2,469,000
Wis., Ill., Ind. and Ky.	2,375,000	2,354,000	2,863,000	2,837,000	2,506,000	3,168,000	3,650,000
Va., Tenn., Ala., Ga., Fla., La.	1,414,000	1,216,000	1,419,000	1,520,000	1,867,000	1,759,000	2,063,000
East'n Mo., Ia., Minn., S.D.	1,736,000	1,569,000	2,323,000	2,223,000	2,544,000	3,092,000	3,745,000
West'n Mo., Neb., Kan., Okla.	1,027,000	1,159,000	1,227,000	1,382,000	1,370,000	1,269,000	1,492,000
Texas	561,000	701,000	603,000	666,000	314,000	546,000	510,000
Colo., Mont., Utah, Wyo., Ida.	260,000	322,000	291,000	299,000	456,000	529,000	506,000
California	1,124,000	991,000	1,192,000	994,000	752,000	991,000	995,000
Oregon and Washington	433,000	322,000	469,000	362,000	392,000	548,000	587,000
	17,474,000	17,216,000	19,901,000	20,273,000	22,580,000	24,372,000	27,428,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1928 AND 1929, IN BARRELS

Month	1928—Production—1929		1928—Shipments—1929		Stocks at end of month 1928	1929
January	9,768,000	9,881,000	6,541,000	5,707,000	25,116,000	26,797,000
February	8,797,000	8,522,000	6,563,000	5,448,000	27,349,000	29,870,000
March	10,223,000	9,969,000	10,135,000	10,113,000	27,445,000	29,724,000
April	13,468,000	13,750,000	13,307,000	13,325,000	27,627,000	30,151,000
May	17,308,000	16,151,000	18,986,000	16,706,000	25,984,000	29,597,000
June	17,497,000	16,775,000	18,421,000	*18,942,000	25,029,000	*27,428,000
July	17,474,000	17,216,000	19,901,000	20,273,000	22,580,000	24,372,000
August	18,759,000		21,970,000		19,374,000	
September	17,884,000		20,460,000		16,799,000	
October	17,533,000		19,836,000		14,579,000	
November	15,068,000		11,951,000		17,769,000	
December	12,189,000		7,384,000		22,650,000	
	175,968,000		175,455,000			

*Revised. †The inclusion of Wyoming begins with April, 1929; of Idaho, with June, 1929.

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN JULY, 1928 AND 1929, IN BARRELS

District	Production 1928	1929	Stocks at end of month 1928	1929
Eastern Pennsylvania, New Jersey and Maryland	3,662,000	3,314,000	1,840,000	2,003,000
New York and Maine	1,159,000	1,108,000	963,000	1,014,000
Ohio, Western Pennsylvania and West Virginia	1,537,000	1,712,000	1,663,000	1,284,000
Michigan	1,310,000	1,287,000	1,357,000	1,034,000
Wisconsin, Illinois, Indiana and Kentucky	1,984,000	1,851,000	1,139,000	1,591,000
Virginia, Tenn., Alabama, Georgia, Florida, Louisiana	1,385,000	1,084,000	966,000	1,020,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,628,000	1,411,000	812,000	869,000
Western Missouri, Nebraska, Kansas and Oklahoma	1,039,000	1,072,000	580,000	624,000
Texas	561,000	652,000	102,000	188,000
Colorado, Montana, Utah, Wyoming and Idaho	229,000	252,000	373,000	459,000
California	1,096,000	1,122,000	1,371,000	1,010,000
Oregon and Washington	391,000	255,000	541,000	511,000
	15,981,000	15,120,000	11,707,000	11,607,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN JUNE, 1929

Imported from	District into which imported	Barrels	Value
Belgium	Connecticut	1,500	$1,547
	Galveston	6,000	6,974
	Los Angeles	44,680	23,222
	Massachusetts	44,161	58,325
	New Orleans	5,947	7,228
	New York	10,387	13,286
	North Carolina	22,115	27,237
	Oregon	3,000	3,190
	Philadelphia	27,030	38,196
	Porto Rico	112	273
	Total	164,932	179,478
Canada	Alaska	8	36
	Maine and N. H.	792	1,774
	Total	800	1,810
Denmark	New York	18,146	18,997
	Porto Rico	13,835	18,509
	Total	31,981	37,506
France	New York	1,250	2,488
	San Francisco	75	124
	Total	1,325	2,612
Germany	Los Angeles	2,875	4,515
	San Francisco	125	246
	Total	3,000	4,761
United K'g'd'm	Philadelphia	1,507	2,003
	Grand total	203,545	$228,170

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN JUNE, 1929

	Barrels	Value
Alaska	2,044	$ 6,156
Hawaii	23,220	57,798
Porto Rico	805	2,633
	26,069	$66,587

*Exports and Imports**

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN JUNE, 1929

Exported to	Barrels	Value
Canada	8,172	$33,919
Central America	17,581	45,685
Cuba	23,676	44,092
Other West Indies and Bermuda	8,969	22,282
Mexico	14,559	38,862
South America	18,644	77,335
Other countries	4,454	25,437
	96,055	$287,612

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

Hangars of Cement, or of Steel?

(An editorial in *Iron Age*)

NO matter what the steel industry may think about the nature of certain competitive activities by others supplying construction materials, it cannot accuse the cement people of being at all hesitant in entering new fields. As has been wittily said, if a man decided at breakfast to build a birdbath in the garden, before lunch he would be visited by a good salesman, convincing him that it ought to be made of concrete.

A case in point is an airport competition, recently announced in double-page spreads in many journals. One of the leading cement companies is offering $10,000 in prizes for acceptable sketch plans for moderate sized airports. As the announcement plainly states, "the buildings and structural features of the airport shall be indicated as though constructed of portland cement products wherever practicable." The prize is big enough to attract architects and engineers of considerable ability, and undoubtedly the winning designs will be copied widely in the near future. What with the hundreds of municipal airports under consideration, the lack of easily available information on the requirements of a commercial airport, and the growing tendency for mass production of engineering projects, it is certain that the winning plans in this competition will be closely duplicated dozens of times, and have much influence in future developments and adaptations.

Consequently, from the viewpoint of the cement industry, it was natural that portland cement should be particularized as the preferred construction material. And lest any one rest satisfied that structural steel is the material par excellence for hangars, shops and miscellaneous sheds, let the reader ponder the following facts:

The enormous airship hangar of the United States Navy at Lakehurst is 803 ft. long, 264 ft. wide and 172 ft. high. The largest hangar in France is at Orly; it is 984 ft. long, 298 ft. wide and 194.5 ft. high. Did the latter use 5000 to 6000 tons of structural steel, as was required at Lakehurst? It did not. It was made of reinforced concrete.

Monolith Portland Fosters Architectural Contest

AN ARCHITECTURAL educational campaign and small home competition sponsored by the Midwest Chapter of the American Institute of Architects for the Monolith Portland Midwest Co. is announced in recent issues of architectural magazines. The closing date is October 15, 1929.

Prizes are offered for the best small designs adapted to midwest climatic conditions and a separate set of awards for the five best articles on the importance and value of architectural services in designing and building a home.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1928 AND 1929

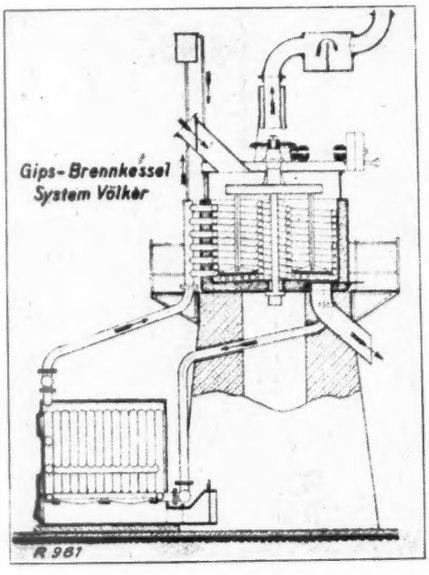
Month	1928—Exports—1929 Barrels	Value	Barrels	Value	1928—Imports—1929 Barrels	Value	Barrels	Value
January	56,400	$204,875	78,639	$283,002	236,771	$315,797	151,302	$177,976
February	62,828	221,620	58,886	225,590	164,408	217,525	118,930	123,123
March	74,983	265,719	69,079	235,164	235,930	330,074	131,909	112,788
April	61,676	205,882	64,145	218,316	249,458	324,371	89,668	114,281
May	70,173	236,005	57,955	219,366	190,509	256,872	200,646	267,854
June	59,536	201,313	96,055	287,612	266,537	359,637	203,545	228,170
July	83,759	291,055			112,887	151,877		
August	88,736	302,866			259,975	358,471		
September	71,995	252,843			173,439	226,295		
October	62,137	246,010			152,210	226,909		
November	69,313	260,310			65,969	89,732		
December	63,120	250,204			175,992	233,300		
	824,656	$2,938,702			2,284,085	$3,090,860		

Foreign Abstracts and Patent Review

New Apparatus for Calcining Gypsum—L. Martin states that in the production of high grade, calcined gypsum, only such processes can be used that prevent an overheating of the gypsum. The gypsum burned in the temperature range of 107 to 160 deg. C. forms a pure semi-hydrate according to the formula $CaSO_4 + \frac{1}{2}H_2O$, and since there are no inert particles, no accelerators and no retarders in the material, the crystallization takes place very rapidly and the set material also dries rapidly. An overheating of the material being burned up to 572 deg. F. implies no deterioration, except that the semi-hydrate converts into soluble anhydrite. This soluble anhydrite has the property of absorbing water from its surroundings, so rapidly that frequently an excess of water occurs and a double hydrate forms again in small quantities. Remnants of gypsum thus set have, however, the disagreeable property of serving as crystal nuclei for the semi-hydrate entering in solution, therefore acting as an accelerator.

The gypsum industry has already available a number of proved processes, but in order to maintain the required temperature of 225 to 320 deg. F. until a complete heating through is obtained, it is necessary in most of the processes to heat the material for an extended time period. If in order to attain a uniform dehydration the gypsum is burned in finely ground condition, there exists danger of overheating since with the burning apparatus universally in use the particles of gypsum near the kettle walls exposed directly to the fire are heated quicker than those further away. It has been attempted to avoid an overheating of the material by heating walls of the gypsum kettles with hot water or steam, but the high fuel consumption made the process uneconomical.

A few years ago an apparatus constructed and tested by H. Voelker was placed in service for the burning of gypsum in an upper Bavarian plant. In this, oil is used in the heating surfaces formed of pipe coils as shown in the accompanying cut. Operating results obtained thus far prove that a nearly pure semi-hydrate is produced in this apparatus. The material burned according to this process is not subject to a conversion into double hydrate by absorption of moisture from the air; tested samples which had lain two years in a shed showing no slackening of the active effect of the hemi-hydrate. The burning plant consists principally of the heater (a coke-fired steel tube boiler) with built-in tube system, in which oil is heated, and of the actual boiler formed of the tubular coils, in which the raw ground gypsum is placed, both connected by the supply and return oil lines. As the heated oil rises in the supply line it distributes itself in the individual heating coils in the cooker, the connections to the heating spirals being as shown. The cooled oil returns by gravity and an expansion tank takes care of pressure compensation, the tank serving also for supplying the oil to the apparatus. The activator operated by the bevel wheels keeps the raw gypsum being heated in constant motion. The vapors discharge through the flue, after releasing the dust particles in the dust chamber. The boiler walls and all supply and discharge pipes are heat-insulated. About 7716 lb. of heating oil with a flash-point of 536 to 554 deg. F. is required and the losses by evaporation, leaks, etc., are only about 220 lb. per year. Coarse coke up to 3.9-in. dia., to which up to 25% pearly coke of 0.2- to 0.6-in. size may be added, is found most suitable for fuel. In continuous operation the average consumption of coke (12,600 B.t.u. per lb.) is about 882 lb. per 10 ton of finished stucco gypsum. But pauses of even a few hours do not cause great losses in heat. The oil enters the tube system of the gypsum burner at a temperature of 437 to 446 deg. F. and has cooled to about 54 deg. F. when leaving the battery. The boiler holds about 4960 lb. of raw gypsum so that from each charge about 3858 lb. of finished stucco gypsum is obtained. The average burning period is a little over two hours, so that in continuous operation, including the one hour charging period, 39,680 to 44,092 lb. of stucco gypsum of the best and always uniform quality can be produced in 24 hours. One man can attend to the plant. The plant wears so little that it is still entirely intact after three years of operation.—*Tonindustrie-Zeitung* (1929), **53, 34,** 655-656.



Gypsum calciner with built-in tube system in which preheated oil is circulated

French Lime-Burning Practice—Engineer E. Masselon discusses the selection, management and exploitation of limestone deposits and the design and the economical operation of lime plants. He gives typical percentages compositions of limestone rocks of eastern France, which are favorable for the manufacture of metallurgical or fat limes. These follow:

SiO_2	1.30%	1.20%	1.00%	0.80%
$Al_2O_3 + Fe_2O_3$	0.40	0.20	0.60	0.65
CaO	54.80	54.50	54.20	54.40
MgO	0.50	0.60	0.40	0.55
Loss on ign.	43.00	43.50	43.80	43.60
	100.00%	100.00%	100.00%	100.00%

These limestones yield a lime of 88 to 91% CaO and of 0.80 to 1.3% silica. The following is the composition of a limestone from the Meuse valley, which is noted for its low silica content:

SiO_2 (silica and combinations)	0.60%
Al_2O_3 plus Fe_2O_3	0.65
CaO	54.35
MgO	0.25
Loss on ignition	44.15
	100.00%

Interesting suggestions on the installation of the lime kiln at the deposits are offered.—*Rev. des Mater. de Constr. et de Trav. Pub.* (1928), **228,** 364-367; **229,** 409-414; **231,** 447-450.

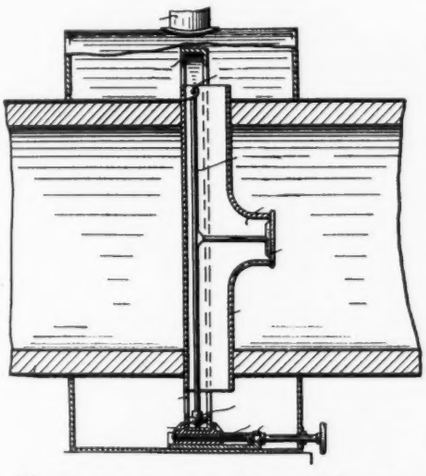
Bauxite and the Alumina Cements—V. Charrin describes bauxite, its substitutes, viz., kaolin, alunite and leucite, and the composition, setting, strengths, resistances, characteristics and various applications of alumina cements. Kaolin deposits he considers too scarce to be considered for alumina cement production. Alunite, a double sulphate of alumina and potash containing 40% of alumina and 10% potash, is suitable, but there are not many workable deposits. Leucite, a double silicate of alumina and potash containing 55% silicates and about 24% of alumina and 21% of potash, can be used; there are several billion tons of this mined in six deposits in Italy. In treatment, the volcanic rock is crushed and passed through a magnetic separator. The silica is precipitated as a sand by-product by hydrochloric acid treatment, leaving the soluble chlorides of the potassium and alumina. By adding water, these chlorides hydrolize and the alumina precipitates. The precipitated material goes to the aluminum foundry, while the remainder, a potassium chloride solution, is evaporated to get solid potassium chloride. The alumina cement is made as "ciment

fondu" in water-jacketed furnaces and recently as "ciment electrofondu" in electric furnaces, both products having the same characteristics and properties. Its composition is about 10% silica, 40% alumina, 10% iron oxide and 40% lime.—*Mines, Carriers, Grandes Enterprises* (1928), **69**, 105-112.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Improved Rotary Kiln—In rotary kilns, such as are used in the manufacture of cement, there are frequently inserted in the kilns near the feed end, metal members, such as cross plates or lifters or chains, for the purpose of promoting the travel of the material through the kiln or of increasing the surface contact of the material with the hot combustion gases to promote the drying or the heating of the material. The temperature of the combustion gases is usually so



Illustrating the method by which air is to be admitted through the kiln shell

intense, however, that such metal members are subject to rapid deterioration. In accordance with the present invention it has been found that this disadvantage can be overcome and a reasonable life assured for such metal members by reducing the temperature of the combustion gases in the kilns, in the zones where such metal members are located, by the introduction into the kilns, below such zones, of a relatively cool gaseous body, such as air or even relatively cooler stack gases.

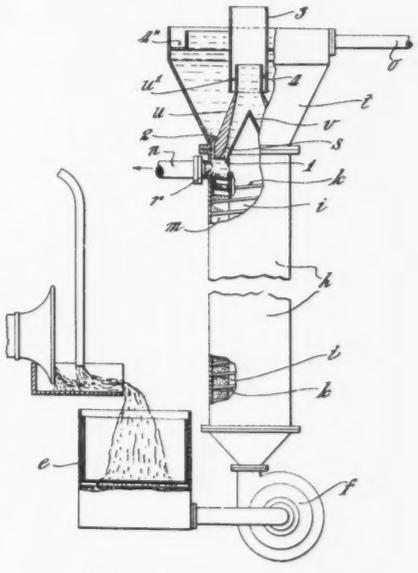
The author of the patent proposes to take either atmospheric air or relatively cool kiln gases and by means of an opening in the shell of the kiln introduce these gases so as to have the desired cooling action at the above-mentioned places. He also describes his method of introducing the cool gas or air so as to prevent the cement in kiln flowing out through the air inlet ports.

If expedient, the air can be slightly heated by passing it through a stationary chamber that would surround the hotter end of the kiln shell and conduct the heated air to the inlet ports by a suitable duct.—*Johan Sigismund, Denmark, assignor to F. L. Smidth & Co.* U. S. Patent No. 1,708,693.

Low-Sintered Hydraulic Cement—The process makes use of the insoluble residues resulting from the decomposition of feldspar-limestone mixtures (U. S. Patent No. 1,345,077). These insoluble portions consisting essentially of lime, silica and alumina are carefully proportioned to give a lime-silica-alumina ratio within the range required for portland cement. The mixture is dried and calcined at a temperature of 2300-2500 deg. F.; this temperature is below the average clinkering temperature for portland cement. Besides lower temperature requirements, the advantages claimed for the process are the production of a quite soft, easily ground material; white-colored product due to the dispensation of iron as a flux. —*Robert de Luce, U. S. Patent No.* 1,713,-172.

Vortex Classifier—If a current of water is forced through a helical (screw form) passage any solids, such as grains of sand, which it carries will be stratified, the larger particles going to the bottom and outside, while the smaller particles go to the top and inside. A classifier using this principle has an outer and inner cylinder, the space between the two being filled with a rib, like a screw conveyor, so as to form a continuous helical passage. The feed, with water, is forced into the bottom by a centrifugal pump. It follows the passage to the top, the sands or other solids being stratified during the trip. The larger solids are taken off through a discharge in the side wall, at a tangent to the outer cylinder. The smaller particles are discharged through an overflow and in the form shown there is a conical head by which a further separation of the smaller grains is made by ordinary settling. The coarser of these grains fall to a passage which connects with the discharge for the larger grains, taken off the side wall. Other forms do not have this conical head, but in its place is a standpipe or other means to provide a head to insure a good flow through the discharge pipe in the outer wall.

The inventor claims that the separation by a vortical current depends wholly on the size of the particle and not at all on its specific gravity, and for this reason the sizing is comparable to that of a screen. The patent specification gives the mathematics of this kind of separation and shows that the



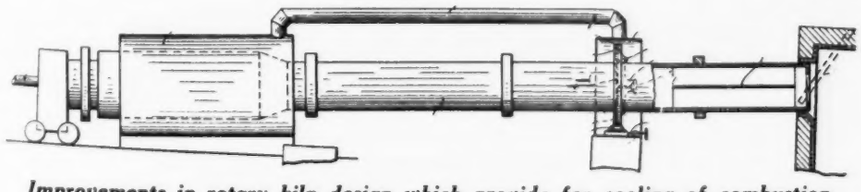
Vortex classifier for sands

effect is produced by pressure against the surface of the grain and that it therefore is proportional to the size of the grain and not to the weight.—*L. Andrews,* February 12, 1929. Patent No. 1,701,942.

Aging Calcined Gypsum—Calcined gypsum, preferably "first settle" material, is placed in a suitable agitating or mixing machine and subjected to the direct action of a fine spray of water or steam. The preferred amounts are 12 to 15 lb. of water per ton of pulverized calcined gypsum per minute and for a period of 5 to 6 minutes while agitating the gypsum. "Double boil" gypsum may be treated likewise, requiring about 100 lb. of water or its equivalent in steam.

Water may be added to the gypsum by means of materials which asborb water mechanically as, for example, through wet or dampened cloths or diatomaceous earth; the gypsum then absorbs the water from these materials.—*S. G. McAnally, U. S. Patent No.* 1,713,879.

Refractory Brick and Cement—A refractory composition containing chiefly chrome ore, magnesia, clay and a low temperature bond, having approximately 10% magnesia and approximately 10% of clay and low temperature bond.—*Russell Heuer, assignor to General Refractories Co., U. S. Patent No.* 1,714,506.



Improvements in rotary kiln design which provide for cooling of combustion gases in zones where metal members are located so as to minimize deterioration of such members

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	July 27	Aug. 3	July 27	Aug. 3
Eastern	4,126	3,923	18,197	18,098
Allegheny	4,019	3,660	10,806	10,931
Pocahontas	454	462	1,590	1,675
Southern	504	678	11,485	11,217
Northwestern	1,414	1,481	10,753	10,071
Central Western	518	440	16,368	15,070
Southwestern	602	546	8,571	8,338
Total	11,637	11,190	77,770	75,400

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

	Limestone Flux 1928 Period to date	1929	Sand, Stone and Gravel 1928	1929
District	Aug. 4	Aug. 3	Aug. 4	Aug. 3
Eastern	84,150	99,129	272,046	283,493
Allegheny	98,311	105,465	195,598	187,660
Pocahontas	13,481	11,513	24,179	25,816
Southern	16,986	15,894	318,179	263,099
Northwestern	38,773	31,752	179,983	162,207
Central Western	12,777	15,709	294,806	291,400
Southwestern	12,803	14,073	179,425	188,598
Total	277,281	293,535	1,464,216	1,402,273

COMPARATIVE TOTAL LOADINGS. 1928 AND 1929

	1928	1929
Limestone flux	*277,281*	*293,535*
Sand, stone, gravel	*1,464,216*	*1,402,273*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning August 24:

CENTRAL FREIGHT ASSOCIATION DOCKET

22421. To establish on **stone, gravel or slate, crushed or ground,** carloads, Danville, Ill., to destinations shown below, following rates, in cents per net ton:

To	Prop.	To	Prop.
South Bend, Ind.	250	Niag. Falls, N. Y.	390
Cincinnati, O.	290	N. Tonawanda, N. Y.	390
Cleveland, O.	350	Erie, Penn.	390
Franklin, O.	290	Brantford, Ont.	390
Lockland, O.	290	Hamilton, Ont.	390
Detroit, Mich.	320	Cold Brock, N. B.	980
Gr. Rapids, Mich.	320	Highland, Que.	680
Lockport, N. Y.	390		

Present rates, sixth class.

22438. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) **and gravel,** carloads, from Kenneth, Ind., to Francesville, Ind. (C. I. & L. Ry. delivery), rate of 80c per net ton. Present rate, 101c per net ton.

22430. To establish on **sand and gravel,** carloads, Richwood, O., to Polk and West Salem, O., rate of 100c per net ton. Present rates, sixth class of 14c to 14½c to Polk and West Salem, O.

22442. To give consideration to question of rates on **crude and washed silica sand,** carloads, from the Ottawa district to points east of the Indiana-Ohio state line versus rates to points west of the Ohio-Indiana state line.

22447. To establish rate of 139c per net ton on **sand, viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica,** carloads, Erie, Penn., to South Oil City, Penn. Present rate, 135c per net ton.

22453. To establish on **crushed stone and crushed stone screenings,** carloads, Delphos, O., to Kingsland, Ind., via N. Y. C. & St. L. R. R., Ohio City, O., Erie R. R., rate of 85c per net ton. Present rate, sixth class rate of 13c.

22459. To establish on **lake or beach sand,** carloads, Grand Haven and Muskegon, Mich., to Saginaw, Mich., rate of 112c per net ton. Present rate, 126c per net ton.

22461. To establish on **crushed stone,** carloads, Lewisburg, O., to Harrison, O., rate of 100c per net ton. Present rate, 110c per net ton.

22464. To establish on **fire sand,** carloads, Niagara Falls, N. Y., to Steubenville, O., rate of 280c per net ton. Present rate, 22c.

22465. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing loam, molding or silica) **and gravel,** carloads, Sandusky, O., to Ceylon and Huron, O., rate of 60c per net ton. Present rate, 70c per net ton.

22466. To establish on **crude cement limestone,** carloads, New Cumberland, W. Va., to Neville Island, Penn., rate of 80c per ton of 2000 lb. Present rate, 13c.

22467. To establish on **refuse limestone screenings,** carloads, from Hillsville and Walford, Penn., to Wampum, Penn., rate of 40c per ton of 2000 lb. Present rate, 50c per net ton of 2000 lb.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

22493. To establish on **sand and gravel,** carloads, Troy, O., to Findlay, O., rate of 90c per net ton, to apply via C. C. C. & St. L. Ry. direct, also via C. C. C. & St. L. Ry., Kenton, O., and N. Y. C. R. R. (West and O. C. L.). Present rate, sixth class.

22494. To establish on **crushed stone,** in bulk, in open top cars, carloads, Woodville, O., to Havana, O., B. & O. R. R. delivery, rate of 85c per net ton. Present rate, 240c per net ton.

22495. To establish on **waste stone, viz., breakwater, chips, rip rap and spauls,** carloads, Bloomington, Clear Creek, Quarry Jct., Dodgson and Victor, Ind., on I. C. R. R., to Louisville, Ky., via I. C. R. R., Indianapolis and Penna. R. R., rate of 153c per net ton. Present rate, sixth class.

22497. To establish on **crushed stone** and **agricultural limestone,** carloads, Thornton, Ill., to Hatfield, Richland, Richland Jct., Rockport, Yankeetown and Grandview, Ind., on the Evansville and Ohio Valley Ry., rate of 145c per net ton. Present rate, combination rates apply.

22506. To establish on **sand and gravel,** carloads, Wapakoneta, O., to Belmore, O., rate of 80c per net ton. Present rate, 90c per net ton.

22507. To establish on **crushed stone,** carloads, Lewisburg, O., to Sunman, Ind., rate of 105c per net ton. Present rates, sixth class.

22508. To establish on **crushed stone,** carloads, Putnamville, Ind., to Sunman, Ind., rate of 110c per net ton. Present rate, sixth class rate of 16½c.

22509. To establish on **crushed stone, also on sand** (except blast, core, engine, filter, fire or furnace, loam, molding or silica) **and gravel,** carloads, Ashtabula Harbor, O., to Ceico, O., rate of 60c per net ton. Present rate, sixth class.

22510. To establish on **sand and gravel,** carloads, from Troy, O., to Ada and Moulton, O., following rates in cents per ton of 2000 lb.:

To	Prop.	Pres.
Ada, O.	95	140
Moulton, O.	80	100

22511. To establish on **crushed stone,** in bulk, in open cars, carloads, Marble Cliff and Sullivan, O., to Cambridge, O., rate of 100c per net ton. Present rate, 110c per net ton.

22512. To establish on **sand and gravel,** carloads, Hamilton, O., to destinations shown below, following rates:

To	Prop.	Pres.
Dayton, O.	60	75
Miamisburg, O.	60	65
Whitfield, O.	60	70

From C. F. A. territory to Western Trunk Line Committee territory.

TRUNK LINE ASSOCIATION DOCKET

20875, Sup. 1. To amend Rate Proposal 20875, covering **ground or pulverized limestone or stone dust,** carloads, from Jamesville, N. Y., to N. Y. C. R. R. and W. S. R. R. stations, by adding Blakeslee, N. Y., as a point of origin on the same basis proposed from Jamesville, with the following exceptions:

To N. Y. C. R. R.	Prop.
Sullivan, N. Y.	$0.90
North Chittenango, N. Y.	.90
Kirkville, N. Y.	.70
Minoa, N. Y.	.90
East Syracuse, N. Y.	1.00
Syracuse, N. Y.	1.00

21443. **Sand and gravel,** carloads (other than molding, foundry, etc., sand), (See Note 2) from Falls and Wyoanna, Penn., to Pottsville, Penn., $1.40 per net ton. Reason—Proposed rate is based on Lycoming scale.

21444. **Stone, crushed,** carloads (See Note 2), from Calcite, Penn., to Chagrin Falls, O., $2.50 per net ton (present rate, $3.40 per net ton). Reason—Proposed rate is comparable with rate to Cleveland, O.

21447. **Glass sand,** carloads (See Note 2), from Mapleton District, Penn., to Ford City, Penn., $1.95 per net ton (present rate, $2.10 per net ton). Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

21451. **Sand and gravel,** other than blast, engine, foundry, glass, molding, sea or silica, carloads (See Note 2), from Alfred, N. Y., to Red House, N. Y., $1.10 per net ton (present rate, $1.20 per net ton). Reason—Proposed rate is comparable with rate to Dayton and Perrysburg, N. Y.

21462. **Sand and gravel,** other than blast, engine, foundry, glass, molding, sea or silica, carloads (See Note 2), from Alfred, N. Y., and Almond, N. Y., to Westfield, Penn., and Freeman, N. Y., to Sabinsville, Penn., inclusive, $1.40 per net ton. (Present rate, $1.50 per net ton.) Reason—Proposed rate is comparable with rates from Winburne, Penn., to Nelson to Westfield, Penn., inclusive.

21463. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand) **and gravel,** carloads (See Note 2), from Tioga, Penn., to Sabinsville, Davis, Gaines, Manhattan and Rexford, Penn., $1.15 per net ton. (Present rate, $1.25 per net ton.) Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

21470. **Limestone, unburnt, ground or pulverized,** carloads, minimum weight 50,000 lb., from points on the B. & O. R. R. in the Grove, Frederick, Security, Martinsburg, Winchester, Strasburg districts to Coalwood and Juno, W. Va., 13c per 100 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

21471. **Building sand,** carloads, in open top equipment (See Note 2), from Hancock, Md., and Round Top, Md., to points on the Western Maryland, B. & O. and P. & L. E. R. R., Lap, Md., Myersdale, Rockwood, Rowan, Penn., Chiefton, Seymour, Davis, Durbin, Spruce, W. Va., and Ellerslie, Md., Hyndman, Penn., Ohio Pyle, Smithfield, Penn., Brydon, W. Va., Crossland, Penn., Sinns, Penn., and various rates ranging from 90c to $1.70 per net ton. Reason—Proposed rates are fairly comparable with rates from Cumberland, Md.

21478. To extend the rate on **sand and gravel,** carloads, of 35c per net ton published from Port Covington and Westport (Baltimore), Md., to Baltimore stations, Arlington and east, to also apply to Mt. Hope, Baltimore, Md.

21499. **Fluxing limestone,** carloads (See Note 2), from Five Oaks, Pounding Mill and Tazewell, Va., to Ashland, Ky., $1.37 per net ton. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

21500. **Crushed stone,** carloads (See Note 2), from Sherburne, Four Corners, Solsville, Oriskany Falls and Munns, N. Y., to Fallsburgh, N. Y., $1.10 per net ton. Rate to expire December 31, 1929. Reason—To meet motor truck competition.

21501. **Sand** (other than blast, engine, foundry, glass, molding, quartz, silica or silex) **and gravel,** carloads (See Note 2), from Solsville and Oriskany Falls, N. Y., to Fallsburgh and East Branch, N. Y., $1.10 per net ton. Rate to expire December 31, 1929. Reason—To meet motor truck competition.

21502. **Brick sand,** carloads (See Note 2), from Mapleton district, Penn., to Port Matilda, Penn., $1.35 per net ton. (Present rate, $1.62 per net ton.) Reason—Proposed rate is comparable with rates on like commodities to Wallaceton, Bigler, Penn., etc.

21504. **Gravel, sand,** other than blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica, carloads (See Note 2), from Machias, N. Y., to Coneyville, Penn., $1.50 per net ton. (Present rate, $1.60 per net ton.) Reason—Proposed rate is comparable with rates on like commodities from and to points in the same general territory.

21351. **Ground limestone,** carloads, minimum weight 50,000 lb., from Baltimore, Grove, Frederick, Lime Kiln, Keller, Buckeystown, Eakle's Mill, Md., Engle, Kearneysville and Martinsburg, W.Va., to Bridgeton, N. J., 14½c per 100 lb.

21537. **Raw dolomite,** carloads (See Note 2), from Shainline, Penn., to Sparrows Point, Md., $1.39 per gross ton. (Present rate, 19c per 100 lb.) Reason—Proposed rate is same as now in effect on fluxing limestone from and to the same points.

21553. **Sand and gravel,** carloads (See Note 2), from Kenvil, N. J., to Rita, Pa., $1.40 per net ton. (Present rate, $1.95 per net ton.) Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

21554. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand) **and gravel,** carloads (See Note 2), from Oaks Corners, N. Y., to Watkins Glen, Montour Falls, Millport and Pine Valley, N. Y., $1.10 per net ton. (Present rate, $1.40 per net ton.) Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

21559. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, **also gravel,** carloads (See Note 2):

	From Baltimore, Md.	
	Prop.—Rate—Pres.	
Collington to Leeland, Md.	95	150
Marlboro, Md.	100	150
Duley to Brandywine, Md.	115	150
Waldorf to La Plata, Md.	125	6th class
Port Tobacco to Popes Creek, Md.	140	6th class

The above rates are in cents per 2000 lb.

Reason—Proposed rates are comparable with rates from Patapsco, Md., to Cheltenham, La Plata, Popes Creek, Md., and Spring Grove, Penn.

1214. To provide in connection with rate of 65c per gross ton on **stone, refuse,** carloads, from Cambria, N. Y., to East Buffalo, Buffalo, N. Y., stations (Carroll St., Louisiana St., Ohio St. and Erie St.), and Black Rock, N. Y., a minimum weight marked capacity of car, but not less than 88,000 lb. (in lieu of current minimum weight marked capacity of car, but not less than 112,000 lb.).

M-1221. **Sand,** carloads (See Note 2), from Mizpah, Weymouth, South Vineland, Clayville, Millville and Menantico, N. J., to Salem, N. J., 86c per net ton, present rate, 92c per net ton. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

21447. **Glass sand,** carloads (See Note 2), from Berkeley Springs, Great Cacapon and Hancock to Ford City, Penn., $1.95 per net ton.

21570. **Sand, blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica,** carloads (See Note 2), from Seward, Penn., to Blairsville, Penn., 72c per net ton (present rate, 90c per net ton). Reason—Proposed rates compare favorably with rates on like commodities from and to points in the same general territory.

21572. **Crushed stone,** carloads (See Note 2), from Harrisonburg, Va., to Staunton, Va., 90c per net ton (present rate, $1.51 per net ton). Reason—Proposed rate is comparable with rates on like commodities from and to points in the same general territory.

21578. **Gravel and sand** (other than blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica) (See Note 2), from Machias, N. Y., to Wilson, N. Y., $1.20 per net ton (present rate, $1.30 per net ton). Reason—Proposed rate compares favorably with rates on like commodities for like distances, services and conditions.

21582. To revise rates on **sand,** carloads (See Note 2), from Berkeley Springs, Great Cacapon and Hancock, W. Va., Hancock, Round Top and Cumberland, Md., and **glass sand,** carloads, from Triplett, Va., to B. & O. R. R. points. Statement of rates will be furnished upon request.

M-1226. **Gravel and sand,** N. O. I. B. N. in O. C., except blast, engine, foundry, glass, molding, quartz, silex and silica (See Note 2), from Utica, N. Y. (N. Y. O. & W.), to stations, New Hartford, to Oriskany Falls, N. Y., inclusive, 50c per net ton, to apply as proportional rate on shipments originating at Sterling Creek, N. Y.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

17613. **Common sand and run of bank gravel,** carloads, minimum weight 50 tons of 2000 lb., from Bedford, Mass., to Boston, Cambridge, Somerville and West Cambridge, Mass. Present rates, 60c per net ton; proposed, 50c per net ton. Reason—To meet motor truck competition.

17625. **Common sand and screened or crushed gravel,** carloads (See Note 3), from Richardson, N. H., to St. Albans, Vt. Present rate, 24½c per 100 lb. ($4.90 per net ton); proposed, $1.90 per net ton. Reason—To grant shippers a commodity rate comparable with other commodity rates now published.

WESTERN TRUNK LINE DOCKET

1564-S. **Stone, crushed,** usual minimum weight, from Dell Rapids, S. D., to Stuart, Ia. Present, combination basis. Proposed to establish rate of 9½c per 100 lb., with routing via C. M. & St. P., Sioux Falls, and C. R. I. & P.

6962-A. **Limestone, agricultural** (suitable for soil treatment), in bags, barrels, boxes or bulk, carloads, minimum weight 60,000 lb., from Dubuque, Ia. (rates in cents per net ton):

To	Pres.	Prop.
Charme, Wis.	140	90
Lynxville, Wis.	150	90
Ferryville, Wis.	150	90
De Soto, Wis.	170	100
Victory, Wis.	180	100
Genoa, Wis.	180	100
Stoddard, Wis.	190	100
Calvert, Wis.	190	110

2051-J-J. **Stone, crushed** carloads, from Jasper and Quartzite, Minn., to Hastings, Neb. Present rate, 14½c per 100 lb.; proposed, 12½c per 100 lb.

6962-B. **Limestone, agricultural,** in bags, barrels, boxes or bulk, minimum weight 60,000 lb., from Dubuque, Ia., to stations on branch lines per below. Rates, La Farge branch:

To	Distance	Pres.	Prop.
Belle Center, Wis.	97.2	$1.80	$1.00
Viola, Wis.	118.8	2.00	1.10
La Farge, Wis.	124.5	2.10	1.10
RICHLAND CENTER BRANCH			
Richland Center, Wis.	125.2	2.10	1.10
PRAIRIE DU SAC BRANCH			
Prairie du Sac, Wis.	140.3	2.10	1.20

SOUTHERN FREIGHT ASSOCIATION DOCKET

46753. **Stone, crushed and broken,** from Yellow Rock, Ky., to O. & K. Ry. stations. It is proposed to establish commodity rates on crushed and broken stone, carloads, from Yellow Rock, Ky., to stations on the O. & K. Ry., made on basis of the 17517 joint Trunk Line scale, such rates to expire four months from the date they become effective. Proposed rates to representative points are: To Cane Creek, Ky., 85c; Progressive, Ky., 85c; Hampton, Ky., 95c; Caney, Ky., 95c; Licking River, Ky., 105c per net ton.

46803. **Crushed marble,** from Tate, Ga., and crushed stone, from Whitestone, Ga., to Galesburg, Ill. Present rate, 568c per net ton, Chicago, Ill., combination. Proposed rate on, from Tate, Ga., marble, crushed, carloads (See Note 3); from Whitestone, Ga., stone, crushed, carloads (See Note 3), from Whitestone and Tate, Ga., to Galesburg, Ill., 529c per net ton, same as applicable from these origins to Burlington and Ft. Madison, Ia., also the same as available on crushed stone, carloads, from Whitestone, Ga., to Rock Island, Ill.

Georgia Sand and Gravel Rates

ATTORNEY-EXAMINER E. H. WATERS, in No. 17517, rates on chert, clay, sand, and gravel within the state of Georgia, upon further hearing, has proposed that the Commission find unduly prejudicial to interstate shippers and unduly preferential of intrastate shippers, the rates and minimum weights required by state authority on sand, gravel, crushed stone and allied commodities, for application within Georgia, and unjustly discriminatory against interstate commerce.

The proposed report also covers No. 17763, Roquemore Gravel Co. et al., vs. Atlanta, Birmingham & Atlantic et al., also on further hearing. In that report Waters said the Commission should find that undue prejudice resulted to the complainant at Montgomery, Ala., and undue preference of shippers between points in Georgia from the relation of interstate rates and minimum weights on sand and gravel, from Montgomery to destinations in Georgia, and intrastate rates and minimum weights on sand, gravel and crushed stone, from points in Georgia to the same destinations.

Waters said the Commission should require the removal of the undue prejudice, undue preference and unjust discrimination by the use of the same scale in Georgia as it prescribed in the original report herein, 122 I. C. C. 133, for use between points in Georgia and points in other southern states, except Florida. He said the record showed that, owing to competition, some of the weak or short lines had not availed themselves of the permission, given in the original report, to impose an arbitrary of 25 cents per ton. The findings proposed by him in this report, he said, should not be understood as authorizing such short or weak lines as had abandoned the use of the arbitrary in connection with interstate commerce to apply it in connection with traffic in Georgia. He said the record did not afford a sufficient basis for a finding of undue prejudice on rates from Chattanooga.

I. C. C. Decisions

Upon reconsideration in No. 17817 Sub. No. 1, Illinois Silica Sand Traffic Bureau vs. Santa Fe et al., and cases grouped therewith, the Commission, by division 1, in a report written by Commissioner Taylor, has modified the formula for computing distances under rates found reasonable in original reports, 152 I. C. C. 749; 153 I. C. C. 469, and 721.

In the original report in the title case, said Commissioner Taylor, the Commission prescribed a distance scale of rates on washed or processed silica sand, and on crude silica sand, from the Ottawa, Ill., sand district, to various destinations in Indiana, Michigan, and Wisconsin. It was provided that distances under this scale "shall be determined by the shortest routes over which traffic can be moved without transfer of lading" and that "lines under common ownership or control shall be considered as a single line, except where a portion of the same railroad is used more than once, it may be considered as a separate line each time it is used."

Distances under the rates prescribed, the Commission now finds, should be determined in the manner used by the carriers in central territory respecting class rates as set forth in the C. F. A. Class Scale Case, 45 I. C. C. 254. The finding is without prejudice to any different conclusion that may be reached following decision in No. 15879, Eastern Class Rate Investigation.

Reducing Accidents at the Des Moines Mill of the Pennsylvania-Dixie Cement Corporation

By E. N. Dodd
Safety Engineer, Pyramid Portland Cement Co., Des Moines, Iowa

TO PLAN and carry out an effective safety program in a cement mill requires the cooperation and support of every individual involved in the making of a safety record. A safety organization should never lose sight of this fact because it is a most essential factor in bringing to light the many hazards about a plant and in the elimination of them, and in order to bring about this cooperation it is necessary that those who supervise safety work should be earnest in their endeavors if they expect to inspire confidence in the men whose welfare they are promoting. Once this attitude is gained much can be accomplished in preventing accidents caused by carelessness and indifference to safety rules. If the workmen do not have confidence in their safety committee they do not make the effort necessary for a perfect record.

Selling the "Safety" Idea

Safety from one standpoint is a selling proposition. Workmen must be sold the idea that carefulness is of greater advantage to them than carelessness. One of the means employed to do this is the safety bulletin board which is just simply the application of the idea of using billboards or advertising posters to sell commercial goods.

Plant bulletins may be made from photographs of accidents, statistics of results accomplished, statistics showing departmental standing, rules or any other phase of the safety program which it is desired to bring to the workmen's attention. We use the safety bulletin service of the National Safety Council and that of our insurance company at our mill. These bulletins are posted on special bulletin boards in each department of the plant, and we have found that home made posters create a great deal of interest among our employes. In addition to this the Portland Cement Association furnishes us with much valuable literature and safety bulletins such as "Significant Accident Bulletin," accident satistics of the industry and various kinds of safety posters.

A score board such as we use at our mill is instrumental in keeping down the number of accidents. This has been evidenced through the fact that none of our men wish to have their names posted on this board where it will advertise them for the remainder of the year as being careless workermen.

We also use a departmental safety calendar system to aid in keeping the safety idea before the workmen, and at the same time it induces a spirit of competition between the different departments as to their safety records. Safety slogans are submitted each month by the plant men and these slogans are printed on the calendar heads. The calendars are marked each day, a green mark indicating a "safe day" and a red mark denoting that an accident has occurred in that department.

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Safety Committees

Safety committees are of value not only in locating hazards but they are also of value in educating those on the committees to be more careful. This carefulness is again transmitted to the men who are not on the committee. Not only does the safety committee enlist the cooperation of the men for safety, but it also forms a basis for securing cooperation in other directions and it has been found that friendlier relations develop between employer and employe where safety committees are used.

We have a central safety committee composed of all the foremen and department heads at our mill who meet bi-monthly for the purpose of discussing plant safety, passing on new recommendations and investigating the causes of accidents. This meeting includes a workmen's committee composed of four operators or laborers from the mill who are appointed by the central committee. These men serve for a period of four weeks each and are then replaced by other men. In this manner all the workmen participate in carrying on our safety work.

It is the duty of this committee to inspect the entire plant twice each month noting the conditions of sanitation, guards and safety devices and to make recommendations to the central committee, reporting all unsafe practices and conditions at the meeting.

The comparative statistics of our mill for the first six months of 1928 and 1929 proves the value of an active safety committee in the elimination of accidents.

	January-June, inclusive	
	1928	1929
Lost-time accidents	5	0
No lost-time accidents	13	9
Fatal accidents	0	0
Days lost	110	0

The following analysis will serve to indicate the nature of these accidents:

	No. of accidents	Days lost
Eye infections	1	23
Other infections	1	25
Strains and bruises	1	14
Back injuries (strains, etc.)	1	45
Lacerations, punctures and abrasions	1	3
Total	5	110

Over 150 Safety Recommendations Completed

We have worked out and completed over 100 safety recommendations during the past year, most of which were the guarding of gears, pulleys, belts and motors. Recently we installed adjustable eye shields on our

THIS ARTICLE describes methods introduced by the Pennsylvania-Dixie Cement Corp. to reduce accidents in its Des Moines mill purchased a year or more ago from the Pyramid Portland Cement Co. The reduction in the number and severity of mishaps is already apparent. R. A. Bechtold, superintendent of the mill, held a similar position at the Kinsgport, Tenn., mill of this corporation last year when it won the Portland Cement Association trophy for a perfect safety record. The organization work described herein is particularly interesting because it is planned to put the Des Moines mill in the perfect class in 1930.—Editor.

The plant first aid team

One of the bulletin boards in use

grinding machines which gives an added eye protection, and we are now installing disconnect safety switches throughout the mill. This should aid materially in reducing the number of electrical accidents in the future.

Good housekeeping is another feature of the safety program that should not be overlooked. Last summer we started a good housekeeping contest between the different departments of our mill offering a small cash award each month for the cleanest departments. This move resulted in a general clean-up of the entire mill and the painting of motors and machinery.

First Aid Work

A short time ago all the employes of our plant were given a medical examination. A workman who is physically or mentally ill will inevitably be injured sooner or later. If the workman is ill his lowered energy leads him to follow the line of least resistance, which is usually the dangerous way and leads to accidents. Although we have no company doctor, we maintain a first aid station at our plant for the purpose of treating minor injuries. We keep a first aid kit well stocked with the material necessary to do this, and by giving the proper attention to these injuries the men are more prompt to report for treatment, thus helping to eliminate the possibility of infections.

First aid classes were organized at our mill this summer under the supervision and through the cooperation of the U. S. Bureau of Mines and the Portland Cement Association. This training has been carried on to other employes through those who received the initial training and has been the means of stimulating a great deal of interest in general in the safety movement.

The schedule as outlined by the Portland Cement Association for the 1929 June No-Accident Campaign was carried out in detail, and with the result that we incurred no lost time during the month of June.

Winning a Safety Trophy

By Erie J. Ochs

Superintendent, Standard Portland Cement Co., Painesville, Ohio

EVERY MAN working in the cement industry has visions of winning a safety trophy or having a calendar year free from lost time accidents. Ever since the Standard Portland Cement Co. started operating in 1925 a minimum total of lost time accidents was strived for. As year after year passed our record was always tainted with minor accidents which meant the defeat of our aim. These defeated aims did not help the cause since the men were discouraged on account of these setbacks. Their attitude appeared to be passive because these small accidents occurred throughout the year and put the plant into the lost time column.

Safety meetings were held and the different problems discussed. Committees were appointed which consisted of foremen and mill men. While these functioned as a committee and took care of whatever safety work came before them, they could not arouse the men sufficiently so that they showed a real genuine personal interest.

In September 1927 we had our first and only major accident; one of the employes had his arm taken off near the shoulder. At this time we not only studied the cause of this accident but went over all accidents very thoroughly, trying to find out anything that might aid us in our future, something that perhaps we had overlooked. We found that we had no careless or chance-taking employes because they had been taken care of as their cases developed. This probably was the turning point because from the study of the cause of this accident the idea was formulated that soon after was put into effect and has meant so much to the safety of the employes.

Studying the Minor Accidents

The following was the conclusion reached: Accidents formerly had been divided into two classes—minor and major. No study of the major accidents was needed as this classification was so clear that a further division is unnecessary. However, a study of the minor accidents began to show possi-

Erie J. Ochs

bilities and as a result of this study the minor accidents were divided into two classes and called "Injuries" and "Accidents."

The injuries cover bruises, scratches and dust or cement lodging in the eyes, accidents which cover sprains, cuts, and any injury that developed a pronounced swelling almost at once. The reason for this division was apparent when a study of our accidents showed that at least 99% fell into the injury class and invariably meant a loss of

time from one day up to three days.

The big question before us then was if these accidents or injuries were the causes of the lost time charged against us, what methods or means could be taken to eliminate them or cut them down to the smallest possible number.

Neglected Injuries Lose Time

In revision the lost time injuries two things were at once apparent. One was the neglect of the men to properly take care of their cuts and bruises after the laboratory or first aid treatment had been given them. A man injured today will take this injury as a reason for taking a day off and this day following the day of injury automatically means a day lost. A large percentage of these lost time injuries, which showed lost time, did not show lost time immediately but in perhaps two or three days after the injury.

Tabulating these lost time accidents and doctor treatments it was noticed that the doctor calls were high on these neglected injuries and the number of calls and visits were very much greater than the number of injuries. If all the men were sent to the doctor immediately the resulting visits would be lower and the men not suffer lost time due to this neglect.

Immediately a stringent order was put into effect which was as follows—that the first aid man was to give an order to the injured party to see his doctor and have the doctor also treat him.

In a short time the advisability of this move was very evident and the delayed lost time injuries began to disappear. This did not eliminate them completely and a study of lost time accidents of one or two days duration were closely watched.

This ruling, at first thought, may appear to some people to be carrying the safety thought too far but benefits derived by the men in having their lost time days, or days without pay, cut down to a minimum was in a short time appreciated and commented on.

The reflection of this ruling to the company was also noticed. Every Ohio cement company knows of the low compensation rate they enjoy. This company had had three reductions since starting operation. Aside from this low rate a company can have credits or debits depending on their accident rating. Our credit rating has substantialy increased since adoption of this method of handling a! injuries and accidents.

Discouraging the "Day Off" Idea

A man injured today will take this injury as a reason for taking a day off and this day, following the day of injury, automatically meant a day lost. A talk with the different doctors on these losses showed at once that some means had to be taken so that the men would realize that they could not lay off if their injuries did not warrant it.

Specific cases were mentioned to the doctors and invariably they were astonished that the injured party failed to report to work the next day.

With the co-operation of the doctors a scheme was worked out that eliminated this. No matter what the injury, the doctors told the party that they were able to work, or not able to work, the following day and if able to work they were expected to report for work the next morning.

At first these rulings did not bring about the desired results because some of the men would not adhere to them. To show every one that no breaking of these rules would be tolerated the offenders were laid off for several days, and in one case the employe had to be discharged, and all employes were made aware of the reason.

In spite of all of these precautions to prevent injury and eliminate the loss of time, which also meant the loss of wages, the proper spirit could not be aroused. Meetings were held and safety work was continually discussed but no real co-ordination of all concerned apparently was possible.

Single Control of Safety Work Adopted

This plan of conducting the safety work was changed and one man from the mill was appointed. This man is picked with care and he has charge of everything pertaining to safety.

It was not long before this move showed its wisdom; almost at once the men began to talk about and mention unsafe practices and places to this safety director and when it was shown to the employes that the company, from the highest executive down, was with them in all their work, serious safety work became the order of the day and the longer the plant operated without any lost time the more enthused the men became.

Constant vigilance and constant attention to all things pertaining to safety was and is at all times kept before the men. Instead of an individual committee as in the past, the whole plant is the committee and the one man, the safety director, is the one to whom everyone goes when necessary.

At all times the safety work is brought to the foreground. This is done by personal contact with the men. All the men interested, superintendent, foremen, etc., make it their business to say something to someone each day about the safety work.

Interest in the work will lag from time to time. This is to be expected and extra precautions must be taken to eliminate these times. This let down usually occurs during a period when accidents are at their lowest point and nothing is happening throughout the plant so that the men are not on the lookout for accidents. At these periods comments are continually made to the men on the splendid work they are doing and hope is expressed that the good work will continue.

During this time certain departments were more apt than others to show signs of losing time due to something trivial which, if caught in time, could be rectified and this probable hazard eliminated.

For example, the clinker crushing rolls, when operating, always evolve some dust. This dust in winter means nothing to the men and is not thought of, but when the warm weather sets in and a man perspires then there is a possibility that chafing may incapacitate a worker to such an extent that lost time might occur. Not only lost time but if the other employes saw that nothing was done to make that place worth while they would shun it and make it a hard place to keep filled. To overcome this possibility this has been made a rotating position and the men are well satisfied. By rotating I mean two men are available for this position, one for each shift. One is the crusher roll operator and the other is the extra man as carried on each shift. These men change about and in this way are not subject to this continual irritation when working as they would be if no change were made.

Again we find men who cannot stand what little dust may be in the packhouse today. These men may be very good workers so they are transferred to such departments wherein they are not subject to these conditions and thus eliminate a lost time possibility and keep a good man.

Such problems must be worked out by each plant wherever conditions similar to the above exist.

Another factor tending to keep the lost time column clean, and at the same time strengthen the morale of the workmen, is to give a man another job because of an injury which he may have suffered that would keep him away from his regular work.

Citing several instances; a workman unloading rock cars bruised his back crawling out from under a car. According to the doctor who examined him it was advisable to keep him from strenuous work for a day or two. This man replaced the regular mill sweeper who took his place for those days.

Another case was a man, helping the millwrights, bruised his toe and was not to be on his feet as much as his regular position would necessitate him to be. This happened at the time we were starting to take inventory so this man replaced the man who was helping taking of the inventory.

We believe that one of the biggest factors in safety work, to insure complete cooperation with the employes, is the confidence you can instil into the employes, that the company is the secondary consideration throughout his work. When the employes appreciate this they will work so much the harder for it.

We never mention the company in any of our talks. It is always the man who is the one who loses or gains the most and they know this is true because when they lose everyone loses and the reverse also holds.

To date this year we have not suffered any lost time accidents and today the men are striving hard to keep our record clear.

Southwestern Portland Offers 3,442,000 Bbl. Cement at $1.40 per Bbl.

BIDS FOR the cement for the San Gabriel dam were opened by Los Angeles, Calif., county supervisors on August 19. The lowest bid was that of the Southwestern Portland Cement Co., $1.40 per bbl. f. o. b. cement plant. Other bids were that of Fisher-Ross-McDonald-Kahn, who have the contract for the work on the dam, $1.58 f. o. b. mill, and that of J. Fred Larson, $1.83 f. o. b. Los Angeles and dam. Larson is a cement broker in Los Angeles and his bid is supposed to come from Belgian cement manufacturers.

The bid was for 3,442,000 bbl. of cement to be delivered over a period of five years and shipments from nearby mills may be made in bulk. A combined bid from four Southern California mills a year ago was $1.77 f. o. b. mills. The difference amounts to $1,273,000.

The bids were opened in spite of a protest from the Riverside Portland Cement Co. and the California Portland Cement Co. The Riverside Portland is the largest cement manufacturer in Southern California, and, according to the testimony given before an investigating committee of the state senate last year, its published prices are those which are taken into account by all other companies in the district in making bids.

According to the *Los Angeles Examiner*, attorneys representing these companies pointed out that:

"The county specifications were faulty in that the quality of cement called for was to comply with the standard set by the American Society for Testing Materials and that changes in standard might be made at any time, making it impossible for these companies to submit an intelligent bid.

"It was contended that this was an illegal delegation of authority by the board and the two claimed that the supervisors should specify the quality of the cement used. It was asserted that if the supervisors would comply with this request, both companies would submit bids which would mean a substantial saving to the county. However, as the board had previously granted a ten-day postponement and had looked into the grounds on which the attack was made, the bids were ordered opened."

Chief Flood Control Engineer, E. C. Eaton said that he considered the price a very fair one. But he said the county might still decide to erect its own cement plant if it found that by doing so it could save money.

The *Los Angeles Times*, which is consistently "anti" everything which might favor the established cement industry, enlarges on this statement by saying:

"According to Engineer Eaton, the difference in price (between the bids of this year and last year) is attributed to the fact that there was no competition last year, and also to the fact that the county had obtained an option on valuable limestone and shale deposits in San Gabriel Canyon, which it is declared, would enable Los Angeles county to furnish the contractors cement of the best grade at the cost of manufacture.

"So extensive are the deposits of cement material that the county could afford to install kiln and grinding machinery, use it, and then sell it, with enough raw material to insure several years' operation, at a cost that possibly would include a substantial profit.

"The location of the proposed county cement mill is much closer to the dam site than the freight unloading point specified in the contract, indicating a considerable saving in transportation charges, over cement purchased from a distant mill."

Mr. Eaton is quoted by other papers saying that it would take close figuring by the county to show that a mill could be erected and cement manufactured for so low a figure as the quoted price. The lowest recently quoted mill prices are $1.60 at Montreal and $1.65 at Leeds, Ala. The price of $1.40 is said to be below the cost of manufacture for a number of plants in the United States and it is lower than cement is sold for in some European countries which have the advantage of cheap labor. It will indeed require close figuring to show that Los Angeles County can make cement in a new plant for this and pay for the plant as well.

A later news item (dated August 27) states that all bids for cement were rejected because of doubt by the county legal counsel as to the validity of the contract specifications. New bids are to be asked for immediately, it is stated.

Warner Company Building Dry-Dock for Repairs to Marine Equipment

THE WARNER CO. sand and gravel operations near Tullytown, Penn., are conducted in Manor lake, which is cut off from the Delaware river by a high dike. In this lake are six scows, two tugs and two dredges. To facilitate repairs to this equipment the company is constructing a steel-pontoon, or floating, dry-dock 60x72 ft. inside, in the clear.

The dry dock is made in three sections, each 20 ft. long. Each section is capable of lifting 250 to 300 tons. Each section is equipped with its own electric motor and pump, making each a unit by itself. Four water and airtight compartments are built into each unit of the dry dock. Riding light with no water in the compartments the dry-dock will float in 18 in. of water.

The estimated cost of this dry-dock is about $55,000. The Dravo Co., Pittsburgh, Penn., is fabricating it.

Meet the Chairman of the Sand and Gravel Convention Committee!

THE GENTLEMAN whose portrait is presented herewith is W. W. Fischer, president of the Fischer Lime and Cement Co., sand and gravel producers and building supply dealers of Memphis, Tenn. Mr.

W. W. Fischer

Fischer is general chairman of the convention committees for the 1930 annual convention of the National Sand and Gravel Association, to be held at the Peabody hotel, Memphis, January 28-30, inclusive.

Regarding plans for the convention the *National Sand and Gravel Bulletin* says:

"The controlling factor in the selection of papers for the convention will be whether they have a definite relationship to either the production or use of sand and gravel. There will probably be fewer speakers than heretofore and more time will be provided for an open discussion of the speaker's remarks.

"Those in charge of arrangements for the convention would appreciate it if those engaged in the industry would offer suggestions for the program, and recommend topics for discussion which involve problems of the business. This is particularly true of the operating and sales forces of the industry, for it is toward these particular departments that we wish to direct most of our attention.

"One member has already submitted a most helpful suggestion. He made the point that at past conventions of the association the high point of the program was a symposium on matters of interest only to the production end of the sand and gravel industry. It is his idea that the main features of the Memphis convention should be devoted to salesmanship and sales methods. An effort will be made to work out something along this line of constructive service."

Proposed Changes in Rock Tariff Schedule

THE MAJORITY MEMBERSHIP of the United States Senate finance committee has made numerous changes in the proposed tariff schedules passed by the United States House of Representatives. No change, however, is made in the House bill of a proposed 30.4c. per bbl. duty on portland cement. Changes in rock products materials are as follows (the figures are the finance committee's report, those of the House bill and those in the present tariff schedule, respectively):

"Crude magnesite, Finance Committee, 15/32 of 1 cent per pound; House, 5/16 of 1 c. per lb.; 1922, 5/16 of 1 c.

"Plaster rock or gypsum, ground or calcined, Finance Committee, $3 per ton; House, $1.40 per ton; 1922, $1.40 per ton.

"Crude feldspar, Finance Committee, $1 per ton; House, $1.50 per ton; 1922, free.

"Pumice stone, unmanufactured, Finance Committeee, reduced part of a cent on all values; House, one-tenth of 1 cent; 1922, one-tenth of cent.

"Mica, cut or trimmed, Finance Committee, 35%; House, 30%; 1922, 30%.

"Mica splittings, Finance Committee, 25%; House, 30%; 1922, 30%.

"Waste, scrap and ground mica, Finance Committee, 5%; House, 20%; 1922, 20%.

"Powder or powdered talc, steatite or soapstone (except preparations), Finance Committee, 25%; House, ⅜ of 1 cent; 1922, 25%.

Prominent Contractor Upholds Proposed Tariff on Cement

IN A RECENT statement to the Chicago *Tribune*, Oscar W. Rosenthal, president of the O. W. Rosenthal-Cornell Co., large contractors, says that agitation against a duty on cement on the theory that protection for the eastern cement mills will work a hardship on the midwestern home builders and farmers and prevent a decrease in price to the consumer, is ridiculous as well as being based on false logic and lack of knowledge of the building industry. Mr. Rosenthal, who is also president of the Builders' Association of Chicago and the Associated Building Contractors of Illinois, and vice president of the National Association of Building Trade Employes, feels from his study of the situation that the tariff is justified and that Congress may grant the protection asked without in any way endangering the rights of the user.

"Some agricultural representatives in Congress who are better versed in agriculture than in the economics of the building industry have advocated that the contemplated duty on cement be denied," said Mr. Rosenthal. "Without opportunity to study the question at first hand, they are acting under the impression that the competition of foreign cement would lower the cost to the midwestern home builder, which is not the fact.

"Since the days before we had cement mills in the middle west, foreign cement has not reached Chicago. During the period since 1913, there has been no duty on cement imported from Europe, but foreign cement has not reached and can not reach a market farther than a truck haul from the harbor unloading docks. The reason is that on the average, about a third of the price the ordinary user pays for American cement represents domestic (rail) freight costs. These costs are minimized by the location of cement mills in 34 states. Foreign cement producers who bring their output to America in cheap-rate foreign ships are unable to transport their cement inland past American mills owing to the longer hauls at relatively higher transportation costs from the ocean ports, added to heavy handling and warehouse charges.

"Owing to this condition the effects of low-cost foreign competition are concentrated on the American seaboard mills, which have been forced to do business at a loss, according to sworn testimony before the tariff writing committees of Congress.

"The cement mills along the Atlantic coast are fighting for their lives because of the lack of tariff. Protection will save them and their employes, but whether or not there is a tariff the inland consumer will never feel it, for his cement is manufactured nearby. The only way he can be affected is by a general disruption of the industry due to a lack of protection. That would be sure to injure building, not only the larger projects but home building as well."

Three-Cornered Fight on Cement in Oklahoma

THE PORTLAND CEMENT INDUSTRY in the Southwest is getting a great deal of undesirable publicity growing out of the contract to purchase some 320,000 bbl. of cement recently made by the Oklahoma state highway commission. Bids asked for by the commission and offered by several producers were rejected by the commission because it is alleged they were identical. The commission then added 75,000 bbl. to the original proposal and privately placed the business with a cement producer who had not entered the original bidding, at a 10c. price cut under the bid prices.

One competitor, being an Oklahoma corporation and for that reason supposed to be preferred according to the state law, has brought suit to have the contract set aside, partly on that basis, and partly because of the allegation that the original proposal being changed and the revised proposal not being advertised, the contract is illegal. This competitor was also willing to meet the 10c. price cut, it was claimed.

International Cement Tells Its Employes About the Tariff

THE LONE STAR CEMENT CO., New York, subsidiary of the International Cement Corp., has handed to every employe a letter which stated the important bearing of the cement tariff question now pending in Congress upon their very livelihood. The letter of five pages goes into the matter fully. Relative to the cement prices the letter states:

"To meet this competitive situation, the American producer has been selling cement in Boston at $2.08 a barrel, 47 cents under his cost, but still twenty-three cents higher than the cost of laying down Belgian cement. In Charlestown, S. C., he has been selling it for $2.05 a barrel, 61 cents below his cost, but still 32 cents higher than the cost of the Belgian producer to deliver it.

"Why does the domestic producer take these losses? The answer to this is fairly plain. In the first place, he has in the seaboard area an investment of over $300,000,000 which he cannot scrap. In the second place, he cannot seek markets to the west because in that case the freight incurred would be prohibitive unless he sold at a loss which would be as great as he is incurring at the present time by selling in the seaboard area. He has been taking his losses, hoping that he will get some relief. This present proposed tariff of 8 cents per 100 lb., while inadequate to protect him entirely, will help just that much.

"In the third place, a cement mill because of its very nature must keep its tonnage up or go out of business. It is this tonnage necessity, in many cases, which keeps mills operating at a loss as long as it is financially possible to do so."—*Newburg* (N. Y.) *News*.

Florida Portland Reopens With Increased Capacity

THE Florida Portland Cement Co. will resume its operations soon after having been closed down several weeks, with production nearly doubled over the previous output, according to the *Tampa* (Fla.) *Tribune*. The plant has been closed while repairs were being made on machinery, in anticipation of increased business.

W. F. Ives, manager of the company, said business for his firm has increased 32% this year, over the corresponding period last year.

"Our company has no doubts as to the ultimate future of our business or the future of the state," S. W. Storey, vice president of the Florida company said. "We are dependent entirely upon Florida consumption, and this is steadily increasing. The plant here has produced 100,000 bbl. more this year than last, and construction work ahead has caused us to anticipate still greater increases."

Co-operative Selling Association Sues Member for Breach of Contract

READERS of ROCK PRODUCTS will perhaps recall that Wisconsin has a peculiar law, originally intended to permit co-operative buying and selling associations in agricultural lines. The state supreme court subsequently held that it could not be confined to agricultural co-operatives. Hence various other industries, notably the agricultural limestone producers, building supply dealers, etc., have taken advantage of it to organize co-operative selling associations. Among such organizations is the Mineral Aggregate Co-operative Association of Milwaukee, which contracts with its members to sell their products in Milwaukee county, prorating the output of its various competitive members according to the demand.

Now, according to a Milwaukee newspaper, a suit asking damages for breach of contract has been started by the association against one of its members. The complaint charges that last February the defendant firm became a member of the association and signed a contract agreeing to deliver all of its products furnished for use in the county to the association and to market these products through the association. The contract also provided, the complaint says, that if the defendant sold products without their first going through the plaintiff, the defendant agreed to forfeit 30% of the price of the material to the association.

The complaint alleges that this contract was violated in June when the defendant sold to a local construction company products that were to be used in Milwaukee county. The suit asks 30% of the sale price and also asks an injunction to restrain the defendant from contract violations in the future.

Wilcox Gravel Starts Operations

THE NEW all-electric plant of the Wilcox Sand and Gravel Co., Grants Pass, Ore., has started production, according to the *Grants Pass* (Ore.) *Courier*. Erected at a cost of $50,000, the plant has a capacity of about 300 cu. yd. per day. A slackline cableway excavator has been installed to dig material from the river; this delivers to a hopper which feeds a belt conveyor running to the washing plant. All new equipment was installed in the modern cement and frame building comprising the plant proper. The company's other plant about 1½ miles away will be abandoned because of an exhausted gravel supply.

A 700-ft. side track will serve the new plant and four trucks for local delivery will also be operated. An average of six men will be employed.

Nine acres on the south side of the river and 8¾ on the north are owned by Roy Wilcox, who has taken especial care not to destroy the natural beauty of the location. Only two trees were cut for the construction of the whole plant, he said.

A contract for 1000 cu. yd. of concrete graved to be used by the Southern Pacific Ry. in building tunnels has rushed completion of the plant, and the filling of this order will begin immediately.

Ernest Lee Jahncke Further Honored

ERNEST LEE JAHNCKE, known to many ROCK PRODUCTS readers as the head of the Jahncke Service, Inc., New Orleans, La., sand and gravel producers and building supply dealers, now assistant secretary of the Navy, has been further honored by nomination for vice-president of the American Society of Mechanical Engineers. He was born in New Orleans on October 13, 1880. He was educated in its public schools, and later entered Tulane University, from which he was graduated in 1899 with the degrees of B. E. and M. E. Prior to his being named assistant secretary of the Navy, he was president of the Jahncke Dry Docks and Jahncke Service.

Ernest Lee Jahncke

During the World War he was in charge of the Sea Service Bureau and Navigation Schools of the Merchant Fleet, Gulf Section, and received Congressional recognition.

He was very helpful in co-operating with the Federal engineers during the disastrous floods in the Mississippi River valley two years ago, and was a member of the Tri-State Flood Committee and later was appointed president of the Reparation Flood Commission.

Texas Gravel Producers Association Holds Second Annual Meeting

AN UNUSUALLY GOOD ATTENDANCE of producers marked the second annual convention of the Texas Sand and Gravel Producers Association, held in Austin, Texas, at the Stephen F. Austin hotel, on July 30, 1929. An explanation of the representative nature of the gathering may be had in the well-balanced and instructive program arranged by W. W. Carson, Jr., executive engineer of the Texas association.

The meeting was opened by an address of welcome delivered by Hon. P. W. McFadden, mayor of Austin. The next item on the program was an address by Gibb Gilchrist, state highway engineer, who discussed the relation of the sand and gravel industry to the state highway department. He afforded producers a better understanding of this important relationship and his remarks were followed with the keenest interest.

Compensation insurance was the subject of an address by Hon. W. S. Pope, state insurance commissioner, and Herman Brown, president of the Texas highway branch, Associated General Contractors, devoted his remarks to the ever-prominent question of credits and discounts. He was followed by Stanton Walker of the National Sand and Gravel Association, who discussed the activities of the organization with particular reference to engineering and research activities. He described the accomplishments of the organization thus far in this direction and outlined the future program which is designed to furnish information of direct interest to the producers and consumers of sand and gravel.

Following the recess at noon for luncheon, Mr. Walker discussed the program of the national association for a trade practice conference of the sand and gravel industry affecting producers in all parts of the United States. He explained the purpose of the conference and the business evils which it would eliminate through joint and voluntary action by the individual members of the industry. A business meeting of the association was then held, followed by adjournment. The following officers were elected to serve for the coming year: President, T. J. Palm, Texas Sand and Gravel Co., Waco; vice-president, W. H. Gemmer, Texas Construction Material Co., Houston; secretary-treasurer, P. W. Gifford, Gifford-Hill and Co., Dallas. The final feature of the program was marked by a most enjoyable banquet in the evening, at which R. J. Potts presided as toastmaster.—*National Sand and Gravel Bulletin.*

Correction

THE equipment purchased in the United States for the new Russian gravel plant will cost about $50,000 and not $500,000 as stated in ROCK PRODUCTS, August 17 issue.

Reclamation of Rock-Crushing Equipment by Welding*

Arc and Torch Saves Operators 75% on Investment

By P. D. Richards
Superintendent, Consumers Rock and Gravel Co., California Materials plant, Irwindale, Calif.

OF ALL the industries where machinery receives abuse and wear from abrasive surfaces, none compares with the rock crushing industry for destructive quality; for, from the time the products of the industry first touch the shovel teeth that lifts them from their parental bed until their final dumping into the cars that convey them to the customer, they are constantly wearing away, at an amazing rate, the highly expensive machinery that separates, refines and handles them.

To this rule there are no exceptions, for no matter where a crusher may be situated, the destructive process is more or less the same. Wherever a piece of metal touches these products there is a never-ending process that will, in a comparatively short time, destroy the metal involved so that it will be unfit for future use.

Crusher mantle rebuilt by welding

With such an activity as this perpetually cutting away machinery parts that are surprisingly expensive, it develops into a very serious problem for the operator controlling the machinery involved. Before the operator arises the question, "How can I make enough return from my business to pay for the new replacement parts I am continually buying?" To this question there is only one answer—use the arc and the torch wherever possible. Use them to hard-face all surfaces exposed to abrasive contacts; use them to rebuild the worn gears; to rebuild and reconstruct broken parts; and in every manner conceivable where a welding operation is deemed logical. If an operator does this he will save himself 75% average on his machinery investment, for the writer knows from personal experience that this is an exact truth.

As a proof of this statement, the writer has followed through a period of years the cost and upkeep of rock crushing equipment by both processes — the purchase of new parts and the rebuilding of used ones.

For example, take the bowl liner and mantle of a 5½-ft. cone crusher that is worn beyond usage. To replace these parts would cost around $500, not counting the time element, loss of operation, etc., included in the changing process. To rebuild these parts by building up with a self-hardening alloy steel rod, as the case requires, using the arc, would cost approximately $100. Here alone is a saving of $400, and the crusher is as good as a new one.

To further substantiate this saving by welding, take the mantle and concaves for a gyratory crusher costing approximately $500. These parts are worn so that they must be replaced or the old ones rebuilt. The rebuilding process would cost about one-quarter the price of a new one and the operation would be much faster.

Continuing the advisability of this rebuilding is the case of a 2½-yd. dipper front. A new one of these costs about $850, excluding the time necessary for installation. To completely rebuild the lip and worn surface with the arc and a self-hardening alloy steel welding rod the cost would not be over $250 and the rebuilt one will be as good if not better than new.

Another fact covering this program of saving by welding, is the reclaiming of traction links on any size or type of shovel.

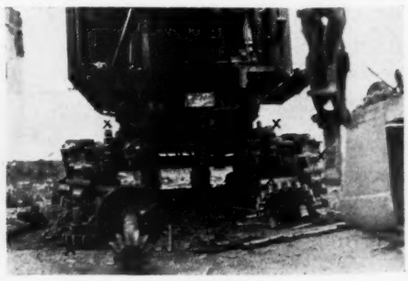
These links sell for from $50 to $125 when new. They can be reclaimed by the arc process, using a high carbon base and a rod surface for from $10 to $30, depending on the size of the link in question.

Rebuilding bucket tips

In the same category as the above is the facing of the dipper teeth with a similar welding rod. A plain manganese tooth wears comparatively well under average usage, but its life is altogether too short. When these teeth wear down they can be saved by use of the arc and a self-hardening alloy steel rod at about one-third the price of a new one, and the life of the rebuilt one will be from four to six times that of a new tooth.

Further important proof of this great economy program by the use of the arc is the reclamation of gear teeth of all types, such as pinion and spur gears, rack pinions and tumblers. The most frequent failure in a gear is broken teeth and in almost every

Rebuilt shovel teeth after 10 days' digging in rock



X-marks indicate gears repaired by welding. Note small amount of dismantling required

*This article published through the courtesy of the Stoody Co., Whittier, Calif.

case these can be welded with the gear in place. When they break it is delay and expense. A good example of this is illustrated by the cuts accompanying this article. This particular gear section costing $85 had a tooth broken out in service when delay was costly. To replace this gear would have involved seven hours time. By inserting a tooth with a high carbon welding rod and the arc the whole operation took two hours and cost about $10. All other gear repairs vary on this same ratio.

And so the various proofs illustrating the advantage of welding instead of buying new

Wearing surface of dipper teeth built up with welding rod

parts continues on into the concaves, mantles, bowles, etc., until there are but very few places left where the arc and torch cannot be applied.

In our plant we use welding wherever, or whenever possible. We keep our own welding outfit and our own welder. A good welder is worth his weight in gold to any rock man.

The photographs accompanying this article tell a story all their own. The writer knows that any operator using these reclaiming processes will be far ahead of his competitors, as the sketch indicates—a 75% average saving on the operator's investment is now a well known fact and no longer a theory. Beyond a doubt, the arc and the torch greatly assist in making this most destructive of industries a profitable business. The welding rod referred to in the work described is made by the Stoody Co., of Whittier, Calif.

Improved Bronze Welding Rod

AN IMPROVED bronze welding rod, designated Oxweld No. 21 high strength bronze welding rod, has been placed on the market by Oxweld Acetylene Co., New York City. This rod is recommended by the makers for all bronze welding applications including the fusion welding of brass and bronze, bronze-welding of malleable and gray iron castings, joining dissimilar metals and building up bearings and other wearing surfaces. Due to its composition it is said to have a uniformly low melting point and easily controlled flow. It is claimed to produce a weld metal as hard and wear resistant as that formerly made with manganese-bronze rod.

Welding Monel Metal

SUCCESS in welding Monel metal requires a knowledge of the properties of this alloy and of its peculiarities under the welding flame. In the welding a few simple precautions must be observed. First, a neutral flame should be used. The tip should be one or two sizes larger than would be required for steel of the same tickness. Cold drawn Monel metal wire or strips cut from sheet should be used as welding rod. As a general rule, flux is not required. The oxide film that forms on the surface of the puddle helps to protect the metal underneath from further oxidation. Keeping the outer envelope

Shovel tooth showing method of building up

of the flame spread over the weld area will also aid in excluding air. The rod should be melted under this skin of oxide and slag. Any particles of dirt or foreign matter should be worked up into the slag by melting underneath them. Then, when the weld is built up well above the surface, grinding will remove all oxide, slag and impurities.

Weld-Repair of Heavy Casting

THE ACCOMPANYING illustration shows a heavy casting which has been repaired by the preheating method. This casting, the main portion of a bending brake, weighing about three tons, fractured clear across the top. This brake was built to bend plate up to ⅜-in. and due to accidental overload it rebelled with the result shown.

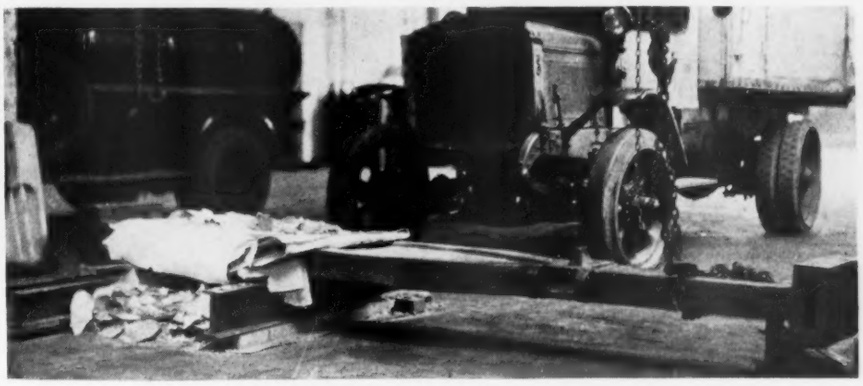
After lining up the casting by supporting it between two I-beams, a temporary preheating furnace was built around the break.

Wearing surface of gear teeth built up with welding rod

A gasoline preheating torch was first employed, and after a few hours of steady flame application charcoal was substituted, and the heat confined by a liberal use of large asbestos sheets. Two welders alternated in the actual welding operation. Actual welding was completed in about 2½ hours. The casting was then allowed to cool very gradually in the dying fire.

New Welding Electrode

LINCOLN Electric Co., Cleveland, has recently brought out the "New Kathode" welding electrode, manufactured for the arc welding of mild steel and for cast iron repair work. The stock lengths are 14-in. and 24-in., shipped in metal containers.



Three-ton casting repaired by pre-heating method

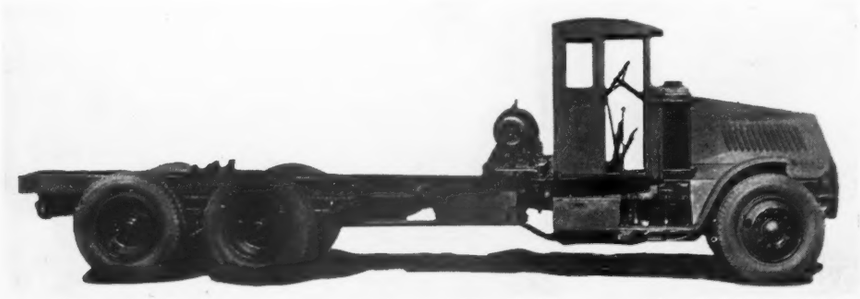
New Machinery and Equipment

New Heavy Duty Motor Trucks

MACK TRUCKS, INC., New York, is now introducing the "Super-Duty" line of trucks, two models of which are designed to carry great loads at high speed. The AP 4-wheeler and the AP 6-wheeler will carry from 7½ to 10 ton truck loads at 30 m.p.h. and climb 20% grades with ease, the manufacturers state, and they will haul 35 ton drawbar loads at 25 m.p.h. These trucks are powered by 6-cylinder high compression engines of 150-hp.

In addition to the AP model, the "Super-Duty" line includes the AC model with a new high compression engine and six wheels. This vehicle is designed, not for speed, but for hauling heavier loads under the conditions encountered in the earth moving industry and other fields.

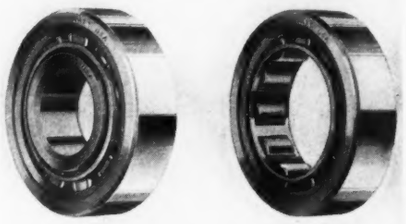
An outstanding innovation, the manufacturers say, is the six-wheel feature with rear, four wheel drive. In this, the characteristic feature, the chain drive, has been retained. The rear truck consists of two dead axles mounted through rubber shock insulators to massive spring tips. The spring is anchored at its base to a horizontal torque bar mounted in the frame so that the load is equally distributed between the two rear axles. The drive is effected by means of four sets of driving chains, each set of rear wheels driven by an independent jackshaft. There are brakes on all rear wheels as well.



Heavy duty motor truck carries 7 1/2- to 10-ton loads at 30 m.p.h.

New Single Row Radial Bearing

A ROLLER BEARING interchangeable with standard S. A. E. single row ball bearings, but having greater load capacity, is announced by the Hyatt Roller Bearing Co., Newark, N. J., who are now also manufacturing single row radial bearings. This new line of bearings, made up of solid rollers, is not intended to replace the standard Hyatt roller bearing which uses spirally wound rollers, but is offered as a supplement to it, for positions in which space limitations exist, and loads beyond the capacity of ball bearings must be sustained.



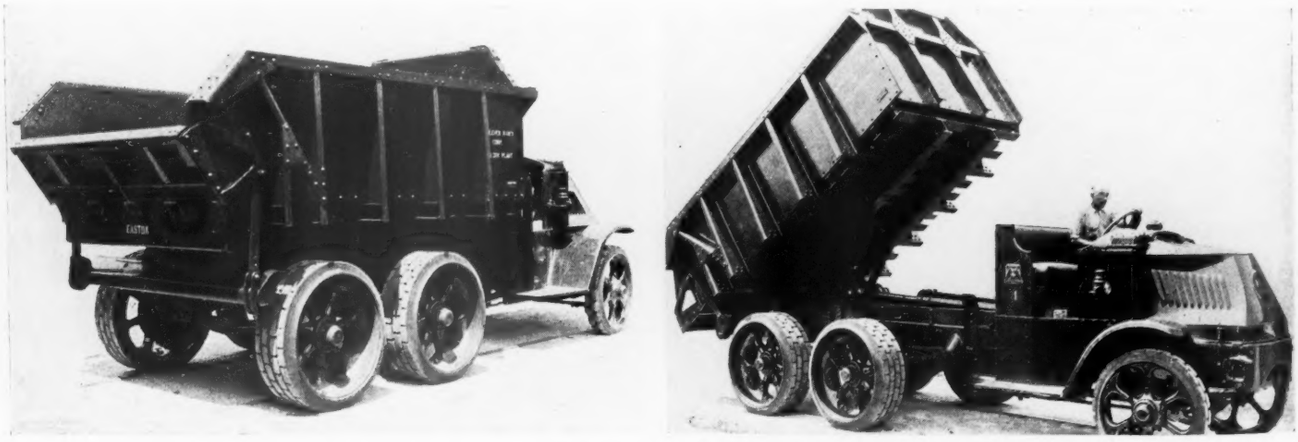
Single row radial bearings shown with and without inner race

The design employed is one in which the rollers are permanently retained with the outer race, the inner race being separable.

It is further stated that the possible separation of this bearing into two parts, the inner race being removable, offers opportunities of developing more economical methods of assembling for all applications with or without the inner race. The roller ends are sufficiently rounded to facilitate assembly where the inner race is not used and both the outer and inner races are chamfered at one end.

New All-Steel Dump Body

EASTON CAR and Construction Co., Easton, Penn., has recently brought out a new all-steel dump body for use with motor trucks. This body is designed to carry 15 tons of rock or other material and weighs 6 tons. As illustrated here it is mounted on a Mack 6-wheeled truck chassis, employing the four-wheel drive and equipped with a Wood hydraulic hoist for raising and lowering the body. Total weight of entire equipment with load is about 28 tons.



New all-steel dump body designed to carry 15 tons of rock, showing the tail construction (left) and the dumping position (right)

New German Digging Bucket Employs Unusual Design

A DEPARTURE from the usual designs of buckets is represented by the "Polyp" bucket, manufactured by Reichmann-Becker Polyp Co., of Duisburg, Germany. As is indicated by the accompanying illustrations, the "Polyp" may be termed a multiple flexible-blade bucket; the blades are not connected rigidly with one another, but operate independently. The blades adjust themselves, it is said, to the material to be handled and dig themselves in like so many fingers of a hand.

The new bucket is built in two types: the open type, with 8 blades, for handling

New digging bucket handling fine material such as sand

steel scrap, etc., and the closed type, designed for handling gravel, sand, stone, coal, coke, etc. One of the principal advantages claimed for the bucket is a full load with each lift. The "Polyp" is built from the smallest size up to 20 cu. yd. capacity. Patents in its design have been granted, while others are pending.

New Multi-Finger Relay

THE GENERAL Electric Co., Schenectady, N. Y., announces a new relay, CR-2820-1080, designed to meet the demand for a multi-finger a.c. device for general purpose use. It is claimed to be small, simple, inexpensive and to provide a large variety of contact arrangements.

The relay consists of a series of double-break, silver-faced fingers operating horizontally and controlled by a small solenoid. The power consumption of the solenoid coil is eight watts. The complete assembly is on a molded base over which fits a drawn-shell cover. This base is provided with holes

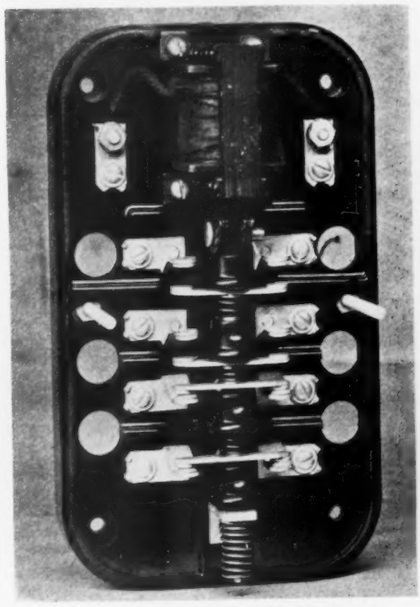
Bucket with flexible blades digging in crushed rock

through which leads may be run when the relay is mounted as a panel device. Creepage and clearance for 550-v. have been provided. The contacts will carry 15-amp. continuously.

By varying the arrangement of the contact fingers, the relay may be arranged for a number of different types of application. The relay may be used when a number of independent circuits are to be controlled remotely and will be useful on signal and dicating circuits, emergency throw-over concontrols and similar applications, the manufactures state.

Develops New Metal

DEVELOPMENT of a new metal known as "Konel," which is said to be quite strong at high temperatures and which can



Multi-fingered relay provides a large variety of contact arrangements

be used in the moving parts of internal combustion engines and other extremely hot places, has been announced by officials of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn. The announcement followed the granting of foreign patent rights.

Originally developed by the Westinghouse research laboratories as a substitute for platinum in the manufacture of filaments for radio tubes, the new metal was discovered to be harder to forge than steel, and to be very tough at high temperatures, when most metals lose their strength. The new metal was created by Dr. E. F. Lowry, a graduate of Ohio State University.

Motor Drive Developed for Underfeed Stokers

AN ELECTRIC motor drive has recently been developed which is applicable to either of the type E and type K underfeed stokers, manufactured by the Combustion Engineering Corp. The drive may be used wherever the steam drive is impractical, as, for instance, where the operating steam pressure is below 60 lb. per sq. in.

The electric drive consists of a double worm gear reduction unit and a Reeves variable speed transmission unit. The motor is located on the flat, top surface of the gear case which provides a convenient and solid support, well removed from the usual floor dirt of the boiler room and is out of the way when the floors are washed. Access to the fire doors is not hindered in any way.

The Reeves mechanism is driven by a silent chain from the motor. The ratio of speed change is from 1 to 8, which is ample for the usual range of combustion rates. For indicating the relative speed, a pointer device is mounted. When a steam pressure regulator is used to secure automatic control of the stoker speed, a lever is substituted for the hand-wheel control of the Reeves drive. The electric drive has been designed so that it is applicable to the use of either high-speed or low-speed motors.

Maxim Silencers on Excavators

A NUMBER of rock products operations are conducted in areas which are close to suburban residences. In some instances the noise made by the exhaust of the gasoline engine or the Diesel engine of the excavator is annoying to the nearby residents. As a means of shutting off complaints of noise from these sources the Maxim silencer has been adopted and found successful in at least one instance. In this case (a contracting outfit) found that its Diesel dragline outfit when equipped with a Maxim silencer could operate quietly, only the mechanical noises of the equipment being discernible and these for only a short distance.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Bound Brook, N. J.	1.35	2.10	1.90	1.50	1.50	.....
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Mo.	.50– .75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Spring, W. Va.	.35	1.25	1.25	1.20	1.15	1.00
Munns, N. Y.	.75	1.00	1.00	1.00	.....	.....
Prospect, N. Y.	.80	1.20	1.20	1.15	1.10	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.65	1.25	1.05	.95	.85	1.00
Shaw's Junction, Penn.	.85e	.....	1.35e	1.35e	1.35e	1.35e
Syracuse, N. Y.	.50	1.00	1.00	1.00	1.00	1.00
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.50	.....	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	.....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Cypress, Ill.	1.60	1.00	1.10	1.00	1.00	1.25
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.95	.95	.95	1.10	1.10	1.10
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05 1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.00	1.00
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90–1.00	1.00–1.10	.90–1.00	.85– .90	.85– .90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.75	.....	1.10	1.00	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	2.50	2.50	2.50	2.50	2.50
Valmeyer, Ill. (fluxing limestone)	.90–1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.90	.....	.90	.90	.90	.90
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	1.15
Chico, Texas	1.00	1.30	1.30	1.25	1.20	.....
Cutler, Fla.	.....	.50– .75r	.....	1.50–1.75r	.....	1.10r
El Paso, Texas (r)	.75–1.00	1.00–1.25	1.00–1.25	1.00	1.00	1.00
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	.90	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (t)	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Chico, Texas	2.50	2.25	1.55	1.25	1.10	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.55	1.25	1.25	1.25
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35–1.40	2.10	1.80–1.90	1.40–1.60	1.40–1.60	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	.....
Toronto, Canada	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.....	.....	1.75	1.75	1.60	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	.....	.....	2.25–2.50s	.....	.....	.....
Lithonia, Ga.—Granite	.75	1.75	1.60	1.25	1.25	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	1.50 to 1.85					
Toccoa, Ga.—Granite	1.50	.....	1.50	1.35	1.30	1.25

(a) Sand. (b) to ⅜ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) High calcite fluxing limestone, 92–98% CaCO, 1.75. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carload prices. (q) Crusher run. 1.40: ¼-in. granolithic finish, 3.00. (r) Cubic yard. (s) 1-in. and less, per cubic yard. (t) Rip rap, 1.20–1.40 per ton.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 99% $CaCO_3$; .03% $MgCO_3$; 90% thru 100 mesh	5.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, 45% thru 200 mesh	a5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 94-98% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh	1.00
Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk	3.50
Paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25 cash 15 days)	
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton	6.00
90% thru 20 mesh, bulk, per ton	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, bags, 3.75; bulk	2.50
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl — Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35–1.60
Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% & 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 101.12%; 60% thru 100 mesh	2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk	3.50
100% thru 4, 30% thru 100, bulk	1.50
Rocky Point, Va. — Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Sibley, Mich.—Analysis, 87.47% $CaCO_3$; 8.30% $MgCO_3$; 60% thru 100 mesh, bulk, per ton, 2.30; 100-lb. paper bags, f.o.b. Sibley, Mich., per ton	3.75
Watertown, N. Y. — Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk	2.75

(a) Less 50c comm. to dealers per ton.

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1% $MgCO_3$; 90% thru 10 mesh	1.50
30% thru 100 mesh	1.50

(Continued on next page)

Agricultural Limestone

Cape Girardeau, Mo.—Analysis, 94½% $CaCO_3$, 3½% $MgCO_3$; 50% thru 50 mesh 1.50

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh 1.00–1.25

Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags 4.50

Colton, Calif.—100% thru 16 mesh, bulk, 4.00; including sacks 5.00

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton 1.25

90% thru 4 mesh, per ton 1.10

Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; 90% thru 50 mesh ..... .95

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00

Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 4% $MgCO_3$; 50% thru 100 mesh 1.50

Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh, sacked 5.00

Kansas City, Mo.—50% thru 100 mesh 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00

Screenings (¼ in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh 3.00

90% thru 50 mesh 2.00

90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .95

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70

Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

West Stockbridge, Mass.—Analysis, 95% $CaCO_3$; 50% thru 50 mesh, bulk 3.50

100 lb. paper bags, 4.25*; cloth 5.25

Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh 2.10

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh 1.10–1.70

*Less 25c cash 15 days.

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks 6.00

Hillsville, Penn., sacks, 5.10; bulk 3.50

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra) 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio—99% thru 100 mesh, bulk, 3.50; in 80-lb. bags (f.o.b. Piqua) 5.00

Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50

Shaw's Junction, Penn.—Analysis, 91.55% $CaCO_3$; 96% $MgCO_3$; 70% thru 100 mesh, bulk 4.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. *1.75–2.25

Cheshire, Mass., in carload lots 5.00–7.00

Estill Springs and Sewanee, Tenn. 1.50

Franklin, Penn. 2.00

Klondike, Mo. 2.00

Massillon, Ohio 3.00

Michigan City, Ind. ..... .30– .35

Ohlton, Ohio 2.50

Ottawa, Ill. 1.25

Red Wing, Minn. 1.50

San Francisco, Calif. 4.00–5.00

Silica and Mendota, Va. 2.00–3.00

St. Louis, Mo. 2.00

Utica and Ottawa, Ill. 75–1.00

Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.30	.40–1.00
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.50	.50	1.15	1.25	1.25	.....
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25	.....	2.25	2.25
Buffalo, N. Y.	1.00	1.05	1.05	.....	.....	.....
Erie, Penn.	.60	.85	1.30	1.30	1.30	.....
Leeds Junction, Me.	.....	.50	1.75a	.....	1.25	1.00c
Machias Jct., N. Y.	.75	.75	.75	.....	.75	.75
Milton, N. H.	.....	.50	.....	.....	.....	.90
Montoursville, Penn.	1.00	.75	.60	.60	.60	.60
Morrisville, Penn.	.50	.40	.90	1.00	1.00	.....
Northern New Jersey	.40– .50	.40– .50	1.25	.....	1.25	.....
Somerset, Penn.	.....	2.00	.....	.....	.....	.....
South Portland, Me.	.....	1.00	2.25	.....	.....	2.00
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*	.....	.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75	.....	1.75
Washington, D. C.	.60	.60	1.20	1.20	1.00	1.00
Georgetown, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Appleton, Minn.	.....	.50	1.25	.....	1.50	.....
Attica, Ind.	All sizes .75–.85					
Barton, Wis.	.....	.40s	.50s	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90n
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio	.....	.75¶	.75¶	.75¶	.75¶	.....
Des Moines, Iowa	.60	.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.40	.40	.55	.85	.85	.....
Elkhart Lake and Glenbeulah, Wis.	.30	.30	.50	.50	.50	.50
Ferrysburg, Mich.	.....	.50– .80	.60–1.00	.60–1.00	.....	.50–1.25
Grand Haven, Mich.	.....	.60	.....	.90	.....	.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio	.....	.85	.85	.....	.85	.....
Hersey, Mich.	.....	.50	.....	.60	.75	.75
Humboldt, Iowa	.50	.50	1.40	1.40	1.40	1.40
Indianapolis, Ind.	.50– .75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Mankato, Minn. (h)	.55	.45	.....	.....	1.25	.....
Mason City, Iowa	.....	.60	.85	1.25	1.25	1.25
Mattoon, Ill.	.75–.85 all sizes					
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (g)	.35	.35	1.35	1.35	1.35	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55t	1.55	1.55	1.65
St. Louis, Mo.†	2.00e	2.00f	2.25t	2.25	2.25	2.35
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Waukesha, Wis.	.....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.50	.50	.....	.....	.....	.....
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.	River sand and gravel, all sizes, 1.40					
Eustis, Fla.	.....	.50	.....	.....	.....	.....
Fort Worth, Texas	.75	.85–1.00	1.00–1.10	1.00–1.10	1.00–1.10	1.00–1.10
Gainesville, Texas	.....	.....	.....	.....	.55	.....
Knoxville, Tenn.	.85	.85	1.50	1.20	1.20	1.20
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00	.....	1.30	1.10	.90
Roseland, La.	.30	.30	1.00	1.00	.80	.80
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75	.....	.....	.....	.....
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Los Angeles, Calif.	.10– .40	.10– .40	.20– .90	.50– .90	.50– .90	.50– .90
Oregon City, Ore.	All grades range from 1.00 to 1.50 per cu. yd.					
Otay, Calif.	.....	.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60	.....	1.25	.....	1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.	.....	.....	.40	.....	.....	.....
Appleton, Minn.	.55	.....	.....	.....	.....	.....
Brookhaven, Miss.	.....	.....	.....	.....	.....	.60
Buffalo, N. Y.	1.10	.95	.....	.85	.....	.85
Burnside, Conn.	.....	.75*	.....	.....	.....	.....
Chicago, Ill.	1.25m	.....	.....	.35	.....	.....
Des Moines, Iowa	.....	.....	.....	.85	.....	.....
Dresden, Ohio	.....	.....	.....	.70	.65	.....
Eau Claire, Chippewa Falls, Wis.	.....	.....	.....	.....	.65	.....
Fort Worth, Texas	.....	.....	.....	.....	.....	.67– .75
Gainesville, Tex.	.....	.....	.....	.....	.55	.....
Grand Rapids, Mich.	.....	.....	.....	.50	.....	.....
Hamilton, Ohio	.....	.....	.....	.....	.70	.....
Hersey, Mich.	.....	.....	.....	.50	.....	.....
Indianapolis, Ind.	Mixed gravel for concrete work, at .65					
Macon, Ga.	.35	.....	.....	.....	.....	.....
Mankato, Minn.	.70	.....	.....	.....	.....	.....
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.	.....	.....	.....	.60	.60	.60
Somerset, Penn.	.....	1.85–2.00	.....	1.50–1.75	.....	.....
Steilacoom, Wash.	.25	.25	.25	.25	.25	.25
St. Louis, Mo.	Mine run gravel, 1.55 per ton					
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.....	.....	.....	.....	.....	.60
York, Penn.	1.10	1.00	.....	.....	.....	.....

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¼-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Per yd., del. by truck, ¼-in. down, 1.25; 2 in. and less, 2.40. (h) ¾- to ¾-in., 1.25. (j) Lake sand, 1.75, delivered. (k) 60–70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.25	2.00	2.25			3.75	
Beach City, Ohio	1.75	1.75		1.50	1.50		
Cheshire, Mass.		Sand for soap, 7.00–8.00				6.00–8.00	
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00–1.25			
Eau Claire, Wis.						2.50–3.00	
Elco, Ill.	Ground silica, 92-99½% thru 325 mesh, 16.00–35.00 per ton						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.00–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00	2.00		
Masillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.50			
New Lexington, Ohio	2.00	1.25					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25	1.25	1.25	1.25	1.25	3.50	3.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.	2.50				2.50		2.00
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Potters sand, 8.00–10.00–12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1¼ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.00	1.00		1.00			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*		1.45*	
Jackson, Ohio		1.05*		1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	.75	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00			18.00		2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[6]
CENTRAL:								
Afton, Mich.						10.75	7.50	12.11
Carey, Ohio	11.50	7.50	7.50		8.00		7.50	1.50
Cold Springs, Ohio		6.50	6.50					
Gibsonburg, Ohio	9.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[10]
Scioto, Ohio	10.50	7.50	7.50	8.50	8.00	.62½	7.00	1.50
Sheboygan, Wis.		10.50	10.50	10.50			9.50	2.00
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio[20]	9.50	6.50	6.50	10.50[24]	8.00	10.00[9]	8.00	1.40[3]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[16]	
Graystone & Landmark, Ala.	12.50	9.00		12.50	8.50		7.50	1.35
Keystone, Ala.	17.00	9.00	9.00	10.00			7.50	1.35
Knoxville, Tenn.	17.00	9.00	9.00	9.00	7.50	.62½	7.50	1.35
Ocala and Kendrick, Fla.		11.00						.75[21]
WESTERN:								
Kirtland, N. M.							10.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.50	15.00	13.00	15.00–19.00	14.50[20]	.90[17]	14.50[19]	1.85[17]
Tehachapi, Calif.[18]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel, 1.60. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] To mortar plant and large industrials, 13.00. [20]Also 13.00. [21] Per ½-bbl. bag. [22] To 9.00. [23] Per bbl., 2.15. [24] Superfine, 99.25% thru 200 mesh. [25] To 16.50. [26] General purpose hydrated lime in 10-lb. paper sacks, 12.50 per ton.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	3.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc, per ton	5.00
Ground talc (20-50 mesh), bags	7.50
Ground talc (150-200 mesh), bags	10.00
Pencils and steel crayons, gross	1.50– 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags (bags extra)	8.00– 8.50
Same, including 50-lb. bags	9.00– 9.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Clifton, Va.:	
Crude talc, per ton	4.00
Ground talc (150-200 mesh), in bags	12.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
Ground talc (200 mesh), bags	13.75
Ground talc (325 mesh), bags	14.75
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.00
Ground talc (150-200 mesh), bags	7.75–11.00
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Los Angeles, Calif.:	
Ground talc (150-200 mesh) in bags	15.00–24.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock	
Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 65-70%	3.75– 4.00
Mt. Pleasant, Tenn.—B.P.L., 75%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00
Ground Rock (2000 lb.)	
Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65–70%	3.75– 4.50
Mt. Pleasant, Tenn.—Lime phosphate: B.P.L., 73%, 80% thru 300 mesh	11.80
Mt. Pleasant, Tenn.—B.P.L., 72%	5.00– 5.50
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Bedford, N. Y.—Mine scrap	12.50–14.70
New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	27.00
Mine scrap	20.00
Roofing mica	38.00
Punch mica, per lb.	.05– .12
Trimmed mica; 50% disc. from list, per ton, 20 mesh, 32.50; 40 mesh, 38.00; 60 mesh, 40.00; 100 mesh, 60.00; 200 mesh	70.00
Trenton, N. J.—Mine scrap, per ton	20.00
Clean shop scrap, per ton	22.00

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream, and American Botticino, coral pink, pearl blush	‖12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	$3.00	$3.00
Crown Point, N. Y.—Mica Spar		¶9.00–‖12.00
Davenport, Ia.—White limestone, in ba	6.00	6.00
Easton, Penn.—Royal green	16.00–20.00a	
Harrisonburg, Va. — Bulk marble (crushed, in bags)	12.50–14.00	12.50–14.00
Ingomar, Ohio — Concrete facings and stucco dash		11.00–18.00
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white		‖9.00–¶10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50
Phillipsburg, N. J.—Royal green granite		18.00–20.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		7.90– 8.40
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.	b5.00	

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb.

Soda Feldspar

DeKalb Jct., N. Y.—Color, white; pulverized, 100% thru 200 mesh, in bags, per ton, 22.00, bulk 20.00; 100% thru 140 mesh, in bags, per ton, 20.00; bulk 18.00

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh 19.00

Bedford Hills, N. Y.—Color, white; analysis, K_2O, 12.26%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; pulverized 78% thru 100 mesh, bulk, 11.00–14.00; crude, bulk, per ton 9.00

Coatesville, Penn.—Natural grit feldspar, per ton, in 100-lb. sacks 8.00

Trenton, N. J.—White; analysis, K_2O, 13-14%; Na_2O, 2-2½%; SiO_2, 64-65%; Fe_2O_3, 0.07%; Al_2O_3, 18.50-19.25%; pulverized, 97% thru 325 mesh, crude, 8.50 per ton, ground 21.00

Rochester, N. Y. 22.00

Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk 11.00–12.50

Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk 15.75–22.50

Pulverized, 20% thru 80 mesh; bags, 17.60; bulk 16.50

Rumney and Cardigan, N. H.—Color, white; analysis, K_2O, 9-12%; Na_2O, trace; SiO_2, 64-67%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Rumney Depot, N. H.—Color, white; analysis, K_2O, 8-13%; Na_2O, 1-1½%; SiO_2, 62-68%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Penland, N. C.—White; crude, bulk 8.00

Ground, bulk 16.50

Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk 18.00

(Bags 15c extra.)

Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra) 18.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Centerville, Iowa	9.25
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per ton	10.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, O. (b)—(Pearl Grit), fine and medium, per ton	¶8.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.	7.50– 9.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

(a) F.o.b. Middlebury, Vt. (b) F.o.b. Piqua, Ohio.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	j13.00–16.00*d
Farmington, Conn.	16.00
Flint, Mich.	18.00†
Grand Rapids, Mich.*	14.00–15.00
Hartford, Conn.	13.00–17.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.50
Madison, Wis.	12.00–12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	15.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (d)	15.00
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

Delivered on job. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (f) In yard, 12.00, 12.25 and 12.50. (h) Also 15.50. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.86¼	3.45	.....
Atlanta, Ga.	.....	2.06*	3.16¶
Baltimore, Md.	.....	2.25	3.55¶
Birmingham, Ala.	.....	1.70*	2.80¶
Boston, Mass. (g)	.44½	1.78–1.88	3.27¶
Buffalo, N. Y.	.48¾	1.95–2.45*	3.35¶
Butte, Mont.	.90¼	3.61	.....
Cedar Rapids, Iowa	.....	2.24	.....
Charleston, S. C.	.....	2.35d	3.15¶
Cheyenne, Wyo.	.66½	2.66	.....
Chicago, Ill.	.....	2.05	3.35¶
Cincinnati, Ohio	.....	2.17–2.57*	3.47¶
Cleveland, Ohio	.....	1.94–2.64*	3.34¶
Columbus, Ohio	.....	2.22–2.62*	3.52¶
Dallas, Texas	.....	1.80	3.39¶
Davenport, Iowa	.....	2.24	.....
Dayton, Ohio	.....	2.21–2.61*	3.51¶
Denver, Colo.	.....	2.55	.....
Des Moines, Iowa	.....	2.14	.....
Detroit, Mich.	.....	1.95–2.35*	3.25¶
Duluth, Minn.	.....	2.04	.....
Houston, Texas	.....	1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09–2.49*	3.39¶
Jackson, Miss.	.....	2.14*	3.24¶
Jacksonville, Fla.	.....	2.31b	3.26¶
Jersey City, N. J.	.....	2.13–2.53*	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.51½	2.06	.....
Louisville, Ky.	.55½	2.47	3.37¶
Memphis, Tenn.	.....	2.14*	3.24¶
Milwaukee, Wis.	.....	2.20–2.60*	3.50¶
Minneapolis, Minn.	.....	2.12–2.22	.....
Montreal, Que.	.....	1.60	.....
New Orleans, La.	.45½	1.82	3.22¶
New York, N. Y.	.48¼	1.93	3.33¶
Norfolk, Va.	.....	1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.	.....	2.22	.....
Pittsburgh, Penn.	.....	2.05–2.45*	3.35¶
Philadelphia, Penn.	.....	2.15	3.45¶
Phoenix, Ariz.	.....	3.91*	.....
Portland, Ore.‡	.....	2.40–2.50a	.....
Reno, Nev.‡	.....	2.91–3.41a	.....
Richmond, Va.	.....	2.32	3.62¶
Salt Lake City, Utah	.70¼	2.81	.....
San Francisco, Calif.‡	.....	2.21–2.71a	.....
Savannah, Ga.	.....	2.31c	3.15¶
St. Louis, Mo.	.48¾	1.95–2.35*	f3.25¶
St. Paul, Minn.	.....	2.12–2.22	.....
Seattle, Wash.	.....	†2.50–2.65j	f3.50†
Tampa, Fla.	.....	2.30	3.30¶
Toledo, Ohio	.....	2.20–2.60*	3.50¶
Topeka, Kan.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.	.....	2.12–2.52*	3.42¶
Winston-Salem, N. C.	.....	2.19	3.49¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Albany, N. Y.	.....	2.15	.....
Bellingham, Wash.	.....	2.10	.....
Buffington, Ind.	.....	1.80	.....
Chattanooga, Tenn.	.....	2.45*	.....
Concrete, Wash.	.....	2.35	.....
Davenport, Calif.	.....	2.05	.....
Hannibal, Mo.	.....	1.90	.....
Hudson, N. Y.	.....	1.75	.....
Leeds, Ala.	.....	1.65	.....
Lime and Oswego, Ore.	.....	2.50‡	.....
Mildred, Kan.	.....	2.35	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.75	.....
Richard City, Tenn.	.....	2.05	.....
Steelton, Minn.	.....	1.85	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.80	.....

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 5c bbl. refund for paid freight bill. (c) 16c bbl. refund for paid freight bill. (d) 20c bbl. refund for paid freight bill. (e) Paid freight bill taken as part payment of invoice. (f) "Velo" cement, including cost of paper bag, 10c disc. 10 days. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. (g) Also 2.33 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Centerville, Iowa	.....	.....	6.00	7.00	.....	7.50	8.50	10.50e	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	4.50–5.00	13.10–14.00	5.00	.....	7.25	.....	.....	.....	.....	25.00
East St. Louis, Ill.	Special Gypsum Products—Interior partition section, 4 in. wide, 12 in. thick and up to 10 ft. 6 in. long, per ton, 21.00; 6x6 in. and up to 10 ft. 6 in. long, per ton, 30.00; floor section, 7x16 in. and up to 13 ft. 6 in. long, per ton, 23.00.												
Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00	.....	15.00	20.00–25.00
Los Angeles, Calif. (f)	5.00	.....	7.50–9.50	12.20	.....	.....	12.20–14.10	13.10	29.00–40.00	11.20–13.10	.....	.....	33.75–41.25
Medicine Lodge, Kan.	.....	.....	.....	.....	.....	.....	.....	.....	15.00y	.....	.....	.....	.....
Oakfield, N. Y.	2.50	.....	.....	5.50	6.00	6.00	.....	5.50	.....	.....	.....	15.00	25.00
Providence, R. I. (x)	.....	.....	.....	12.00–13.00o	.....	.....	.....	.....	.....	.....	.....	Partition block, solid reinforced, 12x30x3", 7c per sq. ft. in truck lots	
Seattle, Wash. (z)	6.00	9.00	9.00	13.00	.....	.....	14.00	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00w	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (e) white molding; (f) plasterboard, 18½c to 25c sq. yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail, 35.00; (w) 16x48; (x) 2- and 3-in. "Fabricaste" gypsum blocks, 8½c sq. ft., f.o.b. job. (y) jute sacks, 18.00; paper sacks, 16.00. (z) Gypsum partition tile, 3-in., 9c per sq. ft.; 4-in., 11c per sq. ft.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	16.50
Cement City, Mich.	55.00¶
Chicago District‖	180.00–210.00a
8x10x16	230.00–260.00a
8x12x16	280.00–330.00a
Columbus, Ohio	15.00c– 17.00†
Detroit, Mich. (d)	.15– .17†
Forest Park, Ill.	21.00*
Grand Rapids, Mich.	11.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.	4x8x12–5.00*
Olivia and Mankato, Minn.	9.50b
Somerset, Penn.	.18– .20
Tiskilwa, Ill.	.16– .18†
Yakima, Wash.	20.00*

*Price per 100 at plant. †Rock or panel face. ‡Delivered. ¶5x8x12, 55.00 per 1000. (a) Face. (b) Per ton. (c) Plain. (d) 8x12x16, rock or panel face, .24–.26.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	
Chicago District "Haydite"	14.00	
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	
Ensley, Ala. ("Slagtex")	14.00	
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.		37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	
Milwaukee, Wis.	14.00	32.00
Mt. Pleasant, N. Y.		14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	
Philadelphia, Penn.	15.50	
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.50
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	

*40% off List.

Cement Building Tile

Camden and Trenton, N. J.:	
3x8x16, per 100, 9.00; 3x9x16, per 100	9.00
4x8x16, per 100, 12.00; 4x9x16, per 100	13.00
6x8x16, per 100, 16.50; 6x9x16, per 100	15.50
Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50–10.00; green or blue, per sq.	11.50–12.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.0c
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	26.50	45.00	53.00
Brownsville, Tex.		53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.		55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.		60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh (94-96% thru 300 mesh), $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton.
Pen Argyl, Penn.—Blue-black, 6.00 per ton.
Granville, N. Y.—Red, green and black, $7.50 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	5/16-in.	⅜-in.	½-in.	¾-in.	1-in.
Buckingham, Oxford, gray	13.88	19.44	24.99	29.44	34.44	45.55	
Bangor, Penn.—No. 1 clear	¶10.50–14.50	24.50	29.00	33.50	44.50	55.60	
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25	
Gen. mediums	9.50–11.25	.....	.....	.....	.....	.....	
No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....	
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00	
Albion mediums	8.00– 9.00	.....	.....	.....	.....	.....	
Chapman Quarries, Penn.—No. 1	8.50–11.25	(Vari-tone, 12.00–13.00)					
Medium	7.75– 9.00	.....	.....	.....	.....	.....	
Hard vein	.....	16.00	23.00	26.00	32.00	40.00	
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00	
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00	
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00	
Red	27.50	33.50	40.00	47.50	62.50	77.50	
Monson, Maine	19.80	24.00	.....	.....	.....	.....	
Pen Argyl, Penn.*							
Graduated slate (blue)	.....	16.00	23.00	27.00	37.00	46.00	
Graduated slate (grey)	.....	18.00	25.00	29.00	39.00	48.00	
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00						
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50						
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50						
Slatedale and Slatington, Penn.—							
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00	
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00	
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00	
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00	

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 10.50–12.50; textural, 12.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., 18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.85½	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job; 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Ideal Cement Stone Company Manufactures a Variety of Concrete Products

One of Omaha, Nebraska's, Largest Concrete Products Companies Enters Twenty-fifth Year

OMAHA, NEBRASKA, for its size has perhaps more concrete products plants than any city of similar size in the United States. The vast areas west and northwest of that city that are practically without timber or other cheap building materials, and also the many small communities located in that prairie country — much too small in most instances to justify the establishment of the usual type of building material operations—are the chief reasons for Omaha becoming the producing and distribution center for building materials of the pre-cast concrete type.

Starting out in a small way twenty-five years ago, the Ideal Cement Stone Co., has grown to the extent of having two plants, each capable of producing 4000 concrete tile per 10-hour day. Its main plant is at 31st and Spaulding streets, and a second or auxiliary unit is located in South Omaha, with the main offices at the former address. Besides manufacturing a wide variety of standard types of block, the company has separate units for production of header block, joist and jamb blocks, partition tile and back-up slabs. A separate department is maintained for the manufacture of ornamental and decorative stone, featuring artistic vases, flower vases, bird baths, lawn furniture, etc. In this connection, one of the noteworthy and attractive features of the plant office is the artistic manner in which the office has been arranged using decorative stone products as ornamental fixtures.

Large Variety of Products Made

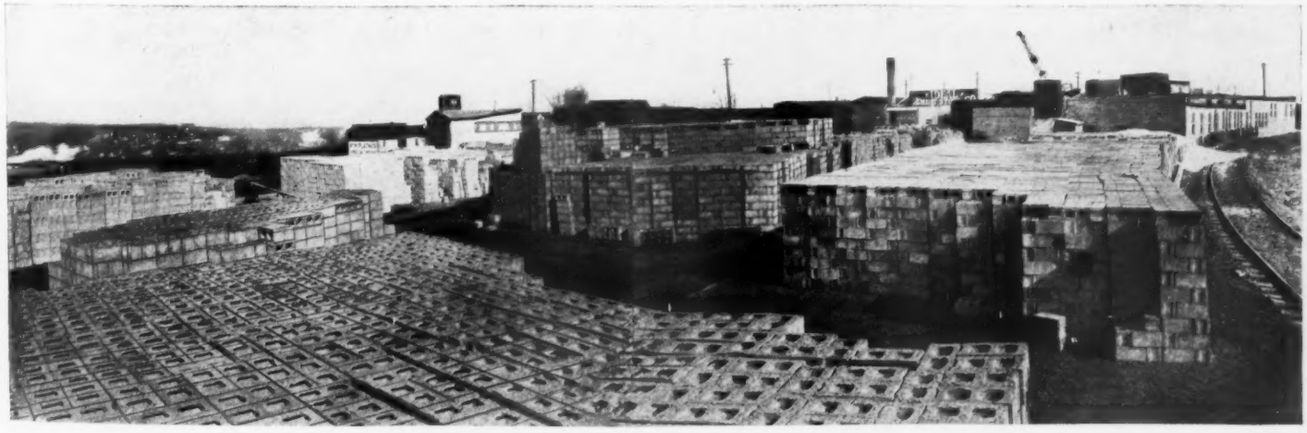
At the Spaulding street plant a large stock of the different concrete tile shapes are kept on hand and shipments can be made in carload lots, as the Belt Line railroad serves this plant. As many of the smaller town dealers cannot handle a full carload of tile, and in order to take advantage of full carload freight rates, mixed cars of building materials are very often shipped, and for this purpose the Ideal Cement Stone Co. carries other building materials, including lime, portland cement, gypsum tile, etc., on hand in a warehouse adjoining the plant.

That the concrete products industry in Omaha is a real up-to-the-minute business is evident when one notes that practically every building erected in recent years in that city has concrete tile in some part of its construction. Many three and four-story business buildings, large apartments, the Christian Orphan's Home and others too numerous to mention, have been constructed practically entirely of concrete tile or of cinder blocks. This last class of masonry units is made in Omaha exclusively by the Ideal Cement Stone Co., under license from the National Building Units Corp., which controls the Straub process patents.

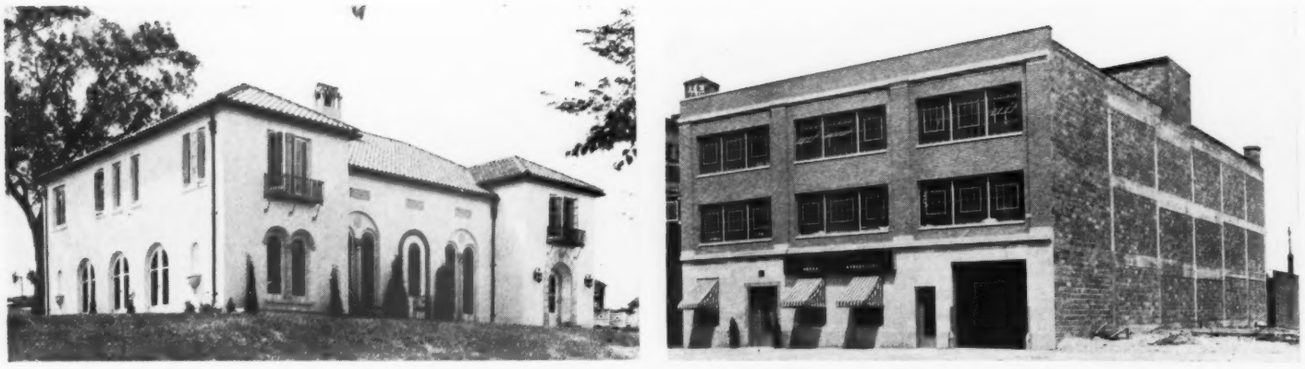
Sand-Gravel Aggregate Used

The aggregate used for concrete tile is locally referred to as sand-gravel, and where a screen analysis shows the following: Plus 40-mesh, 90 to 92%; plus 10-mesh, 48 to 55%, yet it does not convey to the average concrete products manufacturer an adequate mental picture of the aggregate used, and is best described as a coarse sand or, as some localities call it, a concrete sand.

The sand-gravel is delivered to the plant in car lots and unloaded either to a hopper-bottomed bin serving the mixers or to



Part of storage yard for concrete building units



Typical examples of how concrete units are used in residential and business structures in Omaha

ground storage by a Bucyrus crane using a ¾-yd. clamshell bucket. From the bin the sand-gravel is drawn into a two-compartment, two-wheel lorry; one compartment is for the sand-gravel and the other for sand. This mixture is delivered to any of the five concrete mixers that serve the seven Ideal block machines. There are also two other Ideal machines served by one mixer for the production of "fractions" and another machine for cinder block manufacture. Each mixer holds 12 cu. ft. and all, with the exception of the fraction machine, are driven from a single line shaft by a 40-hp. motor.

The plant is built on the side of a low hill and the equipment so arranged that no material has to be elevated, all manufacturing steps preceding by gravity. The mixers discharging direct to the block machines and the blocks after forming are loaded on to small industrial cars and transported to the steam curing rooms. There are about 40 of these chambers, the capacity being such that 4000 tile can be cured each 24 hours. Steam for curing rooms is supplied from a 50-hp. boiler. From the curing tunnels the cars with the tile are transferred to the storage yard and after 28-day yard storage, the tile are ready for shipment.

The building at the Spaulding Street plant is 200 ft. by 200 ft., and is a single story structure built of concrete tile. The management is considering rebuilding the entire plant, installing the latest type of automatic tile machines and other equipment for handling bulk cement, green tiles, etc.

The officers of the Ideal Cement Stone Co. are: Charles Peterson, president, and A. V. Johnson, general manager, vice-president and treasurer.

Manitowoc Products Company to Build New Plant

CONSTRUCTION of a $10,000 plant on a site between the Chicago and North Western and the Soo Line railroad tracks at Manitowoc, Wis., will be started shortly by the Manitowoc Concrete Products Works.

Though only in its fourth year of existence, the company's business has experienced growth that necessitated larger quarters. The plant is now located on Twenty-first street, some distance to the southwest of the site of the new factory.

Plans have not been completed, but H. A. Zimdar said that the new building will be of concrete and steel construction and will be two stories high. There will be ample space for kilns, other equipment and display room.

Work will be started soon so that the plant will be ready for occupation this fall. The company manufactures concrete blocks, and concrete products, the latter having been introduced in this territory by the local company only recently. In addition the company casts stone work and conducts a general concrete construction business.—*Manitowoc* (Wis.) *Times.*

Concrete Pipe Curing

ACCORDING to recent observation of concrete pipe making, two methods of keeping concrete pipe damp during the curing process are used: (1) covering the pipe with burlap that is wet down from time to time, and (2) spraying water with sprinklers, properly spaced, on top of the pipe sections. The burlap has the advantage that considerably less water is requied to wet it down occasionally than to maintain constant sprinkling. On the other hand, time and labor cost is involved in putting the burlap in place and there is a more serious drawback in the fact that water is inclined to follow the burlap rather than the surface of the pipe, so that much of the water is led away from the lower portion of the pipe circumference to drip off the burlap at the low point between rows of pipe. In fact, when burlap is draped across rows of pipe, the under side of the pipe may become almost dry. With the spray, all water (less evaporation) which falls upon the pipe will trickle around to the underside and if the spray nozzles are properly placed some will even get inside the pipe. The continuous sprinkling system, therefore, where the cost of water permits, is believed to be the preferable method.—*Engineering News Record.*

New Products Plant at Tacoma

THE CONCRETE Masonry Units Co., Tacoma, Wash., has started production of concrete building tile under a new process recently developed by K. T. Romie. Present capacity is about 4000 6-in. tile or 3000 8-in. tile per day, which later will be increased by addition of other similar production units. It is a semi-automatic plant equipped with electrically driven motors and the finished product is automatically conveyed to the yard for storage. In addition to the manufacture of the concrete tile or "Hollowstone," manhole blocks are also produced.

The Romie process uses cast iron or steel forms for the block; these forms are kept in a state of constant vibration during the filling so as to compact the concrete mass. When the forms are full, the operator shears

General view of the buildings and plant of the Ideal Cement Stone Co., Omaha, Neb. At the left is the large

off the excess material from the top and then permits a series of overhead pistons to force the completed block out of the form to a pallet below. The pallets are carried by a gravity roller conveyor to yard storage.

F. R. Zaugg, the owner of the company, has long been identified with the cement products industry of the northwest. For a time he was Tacoma city engineer and for three years was associated with the Seattle office of the Portland Cement Association. Just previous to entering business he was secretary of the Northwest Concrete Products Association.—*Tacoma* (Wash.) *News.*

Marble Mosaics and Terrazzo

THE FIRST edition of the catalog and design book on marble mosaic, terrazzo and brass strip work has been published by the National Terrazzo and Mosaic Contractors' Association, Milwaukee, Wis. It contains a complete exhibit of samples of this construction, border designs and design outlines. There are 89 beautiful color plates, illustrating in natural colors the types of floors made with colored aggregates such as are produced by various rock products operators.

The book is divided in sections and in each of these is given general information on the type of mosaic construction, design and an explanation of the uses of the accompanying diagrams. A descriptive matter on the history of various mosaics is also given.

Coke Breeze as a Clinker Aggregate

THE Department of Scientific and Industrial Research, London, Eng., under the direction of F. M. Lea, has published Building Research Bulletin No. 5 on the use of Coke Breeze as a Concrete Aggregate.

Breeze and clinker aggregates contain widely varying amounts of combustible matter which may be present as unburnt coal or any intermediate stage up to particles of ash. Failures in concrete due to coal is attributed to the progressive swelling action of that material and not to the presence of sulphur except in rare instances.

Corrosion of reinforcements in such concrete is due primarily to its permeability. Setting times of breeze concrete is attributed to the presence of excess amounts of fine material. The following limits for sulphur are fixed as safe:

S as Sulphide not over..... 0.45% S
S as Sulphate not over..... 0.40% S

$= 1.0\ \%\ SO_3$

Total Sulphur including that present as Sulphate.....not over 0.75% S.

Copies of this bulletin can be secured from H. M. Stationary office, 16 Old Queen Street, Westminster, S. W.

Gypsum Products in 1928

WHILE the total output of crude gypsum in 1928 fell below that of the previous year, in both quantity and value, and was the lowest since 1924, the output of certain products manufactured from gypsum for use in building construction showed a remarkable growth over recent years according to a report on the gypsum industry shortly to be issued by the United States Bureau of Mines, Department of Commerce.

The total sales of plaster board, lath and wall board in 1928 was 844,377,416 sq. ft., or 711,990 short tons and represents a quantity sufficient for the construction of approximately 210,000 six-room homes.

The sales of plaster board and lath in 1928 was 284,440,741 sq. ft. equivalent to 252,813 short tons valued at $4,107,848, as compared with 280,397,045 sq. ft. equivalent to 249,219 tons valued at $4,669,562 in 1927, a small increase in quantity (footage) and a decrease of 12% in value. The output in 1928 of plaster board was enough to cover the walls of approximately 70,000 homes of the average 6-room type (approximately 4000 sq. ft. per house).

The sales of wall board in 1928 showed a decided increase in quantity over the previous year: 559,936,675 sq. ft., or 459,177 short tons valued at $9,046,926 as compared with 506,163,443 sq. ft., or 415,082 tons valued at $11,165,965 in 1927, an increase of 11% in quantity (footage) and a decrease of 19% in value.

Sanded plaster showed an increase in quantity over 1927: 245,617 short tons, valued at $1,314,480, as compared with 207,210 tons, valued at $1,414,749 for the previous year, an increase of 19% in quantity and a decrease of 7% in value.

Keene's cement, another gypsum plaster used largely as a wall finish, showed an increase in sales in 1928: 54,020 short tons, valued at $848,504, as compared with 41,431 short tons, valued at $674,698 in 1927, an increase of 30% in quantity and 26% in value.

To Resume Manufacture of Natural Cement at Rosendale

PRODUCTION of Rosendale (natural) cement is expected to begin shortly at Rosendale, N. Y., following the remodelling of several old plants and the completion of a new mill in that district by the Century Cement Co. This revival of national cement manufacture in a district that several decades ago (before the usage of artificial portland cement had become so widespread) was famous for its product is the result of an increased demand for this product as a masonry cement, according to the *Kingston* (N. Y.) *Freeman.*

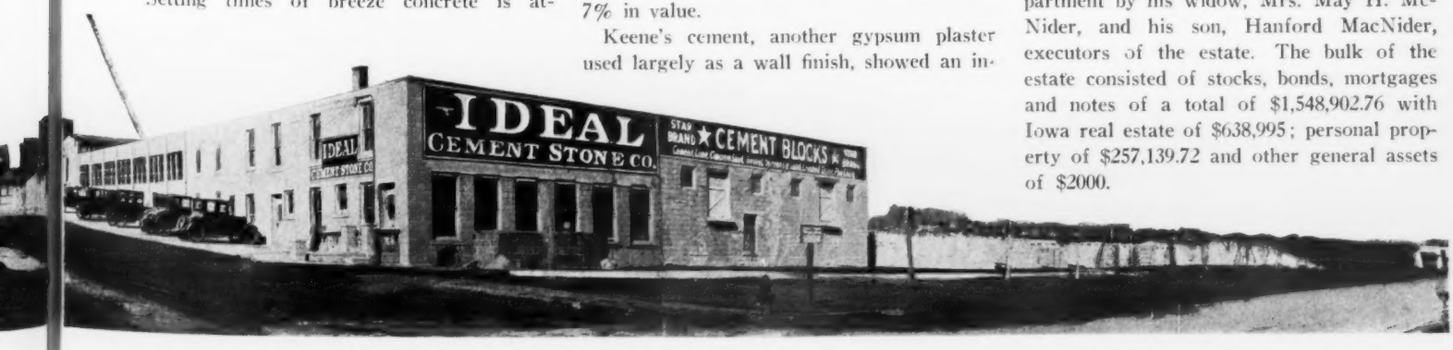
The Century company, recently organized, acquired the Andrew J. Snyder mill which had been operating on a small scale, turning out a limited quantity of cement, and the old Beach mill property between Binnewater and Rosendale.

The Snyder kilns have all been relined and placed in first class order for the burning of cement. A large new mill has been erected, equipped with modern machinery. The Snyder quarries will be operated and a spur over the Beach property connecting the plant with the Wallkill Valley Railroad has been completed and a conveyor for the carrying of the cement from the kilns to the mill has been erected. As the demand grows for the product additions are anticipated.

Erection of the plant and installation of the new machinery has been done by the Burrell Engineering and Construction Co., Chicago.

C. H. McNider Estate Valued at $2,444,037

CHARLES H. McNIDER, late president of the Northwestern States Portland Cement Co., financier and banker, whose death occurred recently, left an estate of $2,447,037.46, according to preliminary report filed with the state inheritance tax department by his widow, Mrs. May H. McNider, and his son, Hanford MacNider, executors of the estate. The bulk of the estate consisted of stocks, bonds, mortgages and notes of a total of $1,548,902.76 with Iowa real estate of $638,995; personal property of $257,139.72 and other general assets of $2000.



garage for the company's trucks, the plant is in the center and the storage yard at the right adjoining the plant

Lone Star of Louisiana Gets Large Cement Contract

A CONTRACT for 2,750,000 bbl. of cement has been awarded to the Lone Star Cement Co., Louisiana, a subsidiary of the International Cement Corp., by the Louisiana state highway department. The cement is to be used during the next two and one-half years on a road-building program in that state. The price bid ranged from $2.12 to $2.48 per bbl. dependant on the point of delivery and is said to have been the lowest rate ever paid by the state. —*Chicago* (Ill.) *Journal of Commerce.*

Sand and Gravel Safety Program Needs Help

AN EDITORIAL in the *National Sand and Gravel Bulletin* states: "It is not out of place to suggest that too few member companies of the National Sand and Gravel Association have entered the safety contest in the industry which is being conducted under the supervision of the Bureau of Mines. The formalities for entering the contest are simple and easily compiled with and it takes only a few minutes to fill in the reports required by the rules of the contest. We urge again that it is not too late to enter the contest and that every member company should participate. It should be kept in mind that the contest is the only means at our disposal for securing badly needed information concerning the amount of lost time in the industry due to accidents. With no readily available data of this kind, we are at a loss to deal with insurance authorities in the fixing of workmen's compensation insurance rates in the sand and gravel industry.

"But there is still another side to be considered. Self-preservation is the first law of human nature, but that impulse should be generous enough to have equal solicitation for the welfare of our employes. There are many sand and gravel plants where the workmen are exposed to needless hazards, capable of being overcome by simple adjustments in the plant structure. Then, again, to use a trite expression, the employes of the sand and gravel industry are not safety-minded. No effort has been made to teach them the value, the urgent necessity, of not taking foolish risks in carrying on their jobs. It has not been brought home to them that it is not they but their families who will suffer if they are injured or killed.

"Educational work is necessary and stringent rules should be laid down for the avoidance of accidents. One can see the words 'Safety First' emblazoned in a hundred signs in every large industrial plant of the United States and Canada, and the employes are cautioned that continued disregard of the safety rules will subject them to discharge. That, perhaps, is the biggest task of all—discouraging employes from exposing themselves to accident and death by taking 'short cuts.' They may say that they have done the same thing a thousand times without mishap, but it should be remembered that an accident has to happen but once.

"There is undoubtedly a severe economic loss to the sand and gravel industry through lost time resulting from avoidable accidents. That loss can be curtailed if the industry becomes sensitive to the true value of safety work. It certainly offers one instance where everyone can co-operate with each other to the mutual advantage of all concerned."

To Develop Tennessee Colored Marble

DISCOVERY of a new outcropping of Holston marble at Powder Springs, Grainger county, Tennessee, has resulted in formation of a $250,000 quarrying corporation, according to the *Knoxville* (Tenn.) *News.*

The new concern, known as the East Tennessee Marble Co., is expected to begin operation in the early fall.

The deposit is on a 50-acre tract, formerly known as the W. S. Needham farm at Powder Springs station on the Middlesboro branch of the Southern railway, two miles from Knoxville. The marble lies in what is known as the Luttrell belt. It contains five strata which range in color from dark cedar to light gray. No effort will be made to mill the stone. The company will confine its efforts to quarrying and selling the product in blocks.

Officers of the company are: W. A. Cockrum, president; Howard Edelen, vice-president; W. J. Sterchi, second vice-president; C. R. Fielden, secretary-treasurer; directors, C. K. Vance, G. T. Fielden and Whiting Newell.

Southern Sand and Gravel Co.'s Assets Sold

REPORT of the sale of all assets of the Southern Sand and Gravel Co. of Sanford, N. C., except the accounts receivable, to E. R. Buchan, the highest bidded, for $3,000, was filed in the office of R. L. Blaylock, clerk of federal court by W. R. Williams and Lacy B. Bradshaw, receivers of that company. Attention was called to the fact that the assets were sold subject to indebtedness of $8,000 due under a deed of trust executed to D. C. Collins. The receivers ask that Judge Johnson J. Hayes confirm the sale.

This is the second sale of the company, a first sale made on June 15 having been voided (see ROCK PRODUCTS, July 20, p. 83) because of the failures of the purchasers to furnish the purchase money. — *Greensboro* (N. C.) *News.*

Atlas Rock Company Leases New Florida Acreage

TWO SECTIONS of land near Red road and 14th street, outside Miami and Coral Gables city limits in the southwest section, have been leased by the Atlas Rock Co. of Miami from the Seminole Fruit and Land Co. on a royalty basis, according to J. Martin Deer, president of the rock company.

The contract calls for joint expenditure by the two parties of approximately $100,000 for machinery and equipment, including 2½ miles of railroad track for hauling crushed rock from the rock plant to the Seaboard Air Line railroad.

Crushed rock will be supplied to building contractors in metropolitan Miami, to road building and maintenance contractors and as ballast for railroad beds. Previously, much rock for these purposes came from the bay bottom for has been taken to destinations by barge or truck fleets. These means of transportation will continue in use by the company.

It is estimated that 50 men will be given regular employment in the production and transportation of the materials from the Red road area.

The Seminole Fruit and Land Co. was organized by the late W. F. Comfort 10 years ago. It became active in the crushed rock business as a sideline to its original citrus fruit business. The Atlas Rock Co. was established March, 1922, by J. W. Deer, Chicago contractor. John Martin Deer, son of the founder, now is president of the organization.—*Miami* (Fla.) *Herald.*

Crushed-Stone and Gravel Plant Engineers

HUGO W. WEIMER, formerly associated with the Galland-Henning Manufacturing Co., Milwaukee, Wis., as consulting engineer, announces the establishment of the H. W. Weimer Co., Milwaukee. In organizing this new company Mr. Weimer has consolidated his engineering work with the design, manufacture and sale of rock products plant equipment. The new company takes over in its entirety the rock products division of the Galland-Henning Manufacturing Co., which is retiring from this field of activity.

Mr. Weimer, who has been a frequent contributor to the columns of ROCK PRODUCTS, was formerly chief engineer of the power-mining plant of the Worthington Pump and Machinery Corp., Cudahy, Wis., at the time it was taken over by the Allis-Chalmers Manufacturing Co., in 1924. Since then he has been assistant chief engineer of the Allis-Chalmers Manufacturing Co.'s crushing and cement machinery department and in independent practice as a consulting engineer and designer of rock products' plant equipment.

"Sandy" Pratt's Swan Song?

MANY of us have chuckled over the humorous bits contained in Clarence "Sandy" Pratt's advertising of his sand and gravel; these ads occurred at frequent intervals in various California newspapers. But, sad as it may be, there are to be no more for "Sandy" Pratt's company has merged with the Pacific Coast Aggregates, Inc. The cut at the right, reproduced from Sandy's last effort (he says it is the last) is typical of the way in which he created a public interest in commodities which have been looked upon as having no "ad" appeal whatsoever.

SAND, ROCK AND GRAVEL COMPANIES IN HUGE MERGER

Twenty sand, rock and gravel companies with resources of more than $20,000,000, and operating twenty producing plants, as well as twenty-five distributing plants, were merged recently under the name of Pacific Coast Aggregates, Inc.

The following well-known firms are included in the merger: Acme Gravel Company, Associated Gravel Company, Ameriver Sand Company, (one of Pratt's subsidiary companies, operating at the mouth of the American River at Sacramento), American River Sand & Gravel Company, (a Pratt concern, operating at Mayhew, near Sacramento), Bay Development Company, T. I. Butler Company, Coast Rock & Gravel Company, Golden Gate-Atlas Material Company, California Rock Company, G. & M. Gravel Company, Piedra Rock Company, Solo Sand Company, California Building Material Company, Pratt Building Material Company, (owners of sand producing plants at Prattco, Sacramento and Marysville), Pratt Rock & Gravel Company, (owners of producing and distributing plants at Sacramento, Prattrock, Mayhew, and San Francisco), Rhodes-Jamieson Company, River Sand & Gravel Company, Santa Clara Gravel Company and Vulcan Rock Company, (a Pratt concern).

Norman B. Livermore, President of the Coast Rock & Gravel Company, will be President of the new concern and George G. Jamieson, President of Rhodes-Jamieson Company of Oakland and Frank W. Erlin of the Coast Rock & Gravel Company are to be the Vice Presidents of the new consolidation.

The area to be served contains one-half of the population of California and represents one of the fastest growing sections in the United States. It extends from Oroville and Folsom on the North, to Monterey on the South and includes the great metropolitan San Francisco Bay District.

It is said the new company is the largest sand, rock and gravel company in the world.—News item.

YOU WILL see.
• • •
FROM THE above news story
• • •
THAT CLARENCE (Sandy) Pratt.
• • •
AND HIS five companies.
• • •
THAT PRODUCE sand and rock
• • •
ARE OUT of business.
• • •
THESE K.C.B-LIKE stories.
• • •
GOOD OR bad.
• • •
AS THEY may have been.
• • •
ARE TO be discontinued.
• • •
THIS IS the last one.
• • •
TO BE published.
• • •
IN THE world.
• • •
HOWEVER, YOU still have Will Rogers.
• • •
YOU MIGHT be interested.
• • •
TO KNOW that Sandy
• • •
HAS WRITTEN and published.
• • •
TWO STORIES each week.
• • •
IN THE S. F Daily Pacific Builder
• • •
SINCE JUNE 15, 1915.
• • •
OR FOR 14 years.
• • •
AND AT two per week.
• • •
1500 DIFFERENT stories were composed
• • •
SANDY BEGAN printing these stories.
• • •
IN THE Sacramento Bee.
• • •
ON MARCH 31st, 1923.
• • •
OF OVER six years ago.
• • •
NEVER MISSED a Saturday's Bee.
• • •
THE BEE printed 328 stories.
• • •
WRITTEN BY Sandy Pratt.
• • •
IF YOU think.
• • •
IT IS easy.
• • •
TO WRITE a different story
• • •
EACH WEEK for 14 years.
• • •
JUST TRY it.

FOR A few months.
• • •
BUT SANDY has enjoyed it.
• • •
HAD SOME adverse criticism.
• • •
AND QUITE a few compliments.
• • •
ON HIS "near-comedy."
• • •
SOME OF Sandy's stories.
• • •
WERE GOOD (so they say)
• • •
MANY, MANY were terrible.
• • •
BUT IT pays to advertise.
• • •
WITH NEW copy each week.
• • •
ESPECIALLY IN the Sacramento Bee
• • •
AND THE S. F Daily Pacific Builder
• • •
AND NOW Sandy.
• • •
TELLING YOU goodbye.
• • •
AS A K.C.B.-like "writer."
• • •
CLOSES HIS "literary career."
• • •
BY SAYING "I thank you."

This sad picture taken by N. O. Sandman, official photographer for Clarence Sandy) Pratt, was photographed on the "shady" or "dark" side of Rock Point, Merger County, California. This sad family, Mr. and Mrs. **CRUSHED Stone** and their beautiful thirty-nine year old daughter, Miss Never Merged (never married) have been "constant readers' of Sandy's "near literature" in the San Francisco Daily Pacific Builder and the Sacramento Bee for many years. They have just been informed that Sandy has sold his sand, rock and gravel business and that these "literary efforts" of Sandy's would cease. They cried so hard that the tears ran down into the apartment below and drowned twenty-one people, nine cats and a pair of canaries.

NOTE:—Above K.C.B.-like story was published in the Daily Pacific Builder (San Francisco) on Thursday, July 25, 1929, and in the Sacramento Bee, (Sacramento, California), Saturday, July 27, 1929.

Cement Producers Reduce Prices

IT is reported that leading cement companies in the New York territory have announced reductions in prices ranging from 20 to 30 cents a barrel, bringing the New York base price to $2.33. Alpha Portland Cement Co., it is stated, was one of the first to announce a reduction of 20 cents a barrel on the Hudson river base and 30 cents a barrel on the Lehigh valley base. The report states that producers in the Chicago district are also reducing cement prices 20c a barrel in line with the price cut in the eastern territory. Lone Star Company of Alabama announced a 20 cent per bbl. reduction on shipments made to the Southeastern territory, exclusive of Tampa, Fla. *Chicago Journal of Commerce.*

Universal Portland Curtails Production at Buffington

LACK of demand for cement has caused a marked curtailment of production at the local plant of the Universal Portland Cement Co., according to general manager J. H. Kempster. The plant is now operating at only 60% capacity.

Mr. Kempster said that lack of road building and large construction projects in the middle west, had caused the general recession of the normal operating level at the local plant.

Mill No. 3 has been idle since April while No. 4 and No. 6 have been greatly reduced. At present the plant is producing about 15,000 bbl. per day compared with a normal level of around 21,000 for this season of the year.—*Calumet* (Ill.) *Record.*

Drying of Solids

AN INTERESTING abstract concerning the mechanism of the drying of solids is presented in the July number of *Abstracts of Scientific and Technical Publications* published by the Massachusetts Institute of Technology, Cambridge, Mass. The author, T. K. Sherwood, has carried out extensive experimental work on the drying of clay, whiting, soap, wood pulp, etc.

News of All the Industry

Incorporations

Paramus Block and Sand Co., Paramus, N. J. Saul N. Emser, Jersey City, N. J.

Sirra Gypsum Products Co., Ltd., Wilmington, Del., $250,000; 5000 shares common.

Wisconsin Lime and Cement Co., Chicago, Ill., changed to Rock Materials and Coal Co.

Newark Sand and Gravel Co., Newark, Ohio, $25,000.

Knox County Gravel Co., Vincennes, Ind., reduced capital stock from 250 shares to 196 shares common.

Mon-O-Tile Concrete Products Co., Kansas City, Mo., $100,000. H. T. White and A. T. Wikersham.

East Tennessee Marble Co., Powder Springs, Tenn., $250,000. President, W. A. Cockrum, Washington Pike, Knoxville.

The Kalbfleisch Corp., Kalamazoo, Mich., 10,000 shares no par value. To quarry and deal in bauxite, rock, sand, cement, etc.

Arpe Sand and Gravel Co., Milwaukee, Wis., 150 shares at $100 each. Peter F. Leuch, Louis E. Fichaux and John Fellenz, Jr.

George B. Hills Co., Jacksonville, Fla., 100 shares no par value. G. B. Hills, El Pl. Luce and M. O. Womble.

Republic Portland Cement Co., San Antonio, Tex., $1,500,000, of which $250,000 is common no par value stock. A. F. Sayers, 1547 W. Agarita St., San Antonio.

Fall Creek Gravel Corp., Indianapolis, Ind., 2000 shares, no par value. Wallace W. Maines, John C. Hessong, Art E. Eaton and Marshall T. Scott.

Jonesville Gravel Corp., Ft. Wayne, Ind., 600 shares. $100 each, and 300 shares no par value. John F. Brooks, Lester E. Ginn and L. E. Marsh.

Concrete Building Units Corp., Minneapolis, Minn., $200,000. Richard A. Peterson, president; Edward O. Johnson, vice-president; W. W. Gibson, secretary, and Robert A. Anderson, treasurer.

Illinois Lime and Cement Co., Chicago, changed to Wisconsin Lime and Cement Co. Correspondent: Gallagher, Kohlsaat, Rinaker and Wilkinson, 231 S. La Salle St., Chicago.

Oranville Wash Sand and Gravel Co., Milwaukee, Wis., 100 shares at $100 each. Peter F. Leuch, Louis E. Fichaux and John C. Fellenz, Jr. Jr.

Natural Lannon Stone Corp., Milwaukee, Wis., $50,000 (100 shares common and 400 shares preferred at $100 each). To operate stone quarries and gravel pits. A. J. Hochuli, J. Wiegert and M. M. Guelduer.

Mica Products Corp., Norfolk, Va., $25,000 to $100,000. To operate 37 mining properties in Virginia and North Carolina producing mica and feldspar. President, H. C. Field, Martinsville, Va.; M. G. Nusbaum, vice-president, and J. B. Hecht, secretary-treasurer, Norfolk.

Quarries

Indianapolis Oolitic Stone Co., Stinesville, Ind., is reported to be in receivership.

Granite, Colo. According to reports, erection of a mill to pulverize granite will soon be started here.

Swank Stone Quarry is installing new machinery, including two stone crushers and an elevator, at its plant west of Farmington, Iowa.

Oakdale Granite Works, Davenport, Iowa, has filed voluntary petition in bankruptcy. The liabilities are scheduled as $14,621.78 and assets at $4746.

Murfreesboro, Tenn. Woods Brothers, Concord, Tenn., have opened a limestone quarry on the O. J. Hardin farm near this city. The marble deposits on the same farm are reported to be under consideration by several large firms.

Florida Basic Rock Co., Marianna, Fla., has been awarded contract by the Florida state road department for a large tonnage of lime rock to be shipped to the Coastal highway, east of Panama City.

Wetmore-Morse Granite Co., Barre, Vt., is planning a one-story machine and forge shop, 50x150 ft., to cost about $45,000 with equipment. L. F. Caroni & Co., New Haven, Conn., are the architects.

Sand and Gravel

Indiana Gravel Co., Indianapolis, Ind., is building an office building at 708 W. 13th St., Indianapolis.

T. E. House and associates, Smithville, Tex., have leased the Colorado Valley gravel pit and will begin operating the plant immediately.

R. F. Nash, Greenville, S. C., has been granted permission by the city council to construct a sand and gravel distributing plant on the C. W. C. railroad and the city limit line.

Irving Bros. Gravel Co., Fort Wayne and Kendallville, Ind., is constructing a plant at Marion, Ind., to cost approximately $25,000. F. W. Irving is to take charge of the plant.

Parker Gravel Co., West Monroe, La., has recently installed a new Diesel-operated dragline equipped with 85-ft. boom and 1½-cu. yd. bucket. The new machine, said to cost about $45,000, makes the fourth dragline in use at the plant.

L. W. Boling, Clyde, Kan., has reopened his sand pumping plant on the river here. The equipment was sunk last spring by the high waters, but it has been raised, repaired and a new boat built to house it.

Cement

Halifax Harbor Commission, Nova Scotia, Can., has placed a £150,000 cement order with the Lafarge Aluminous Cement Co., Essex, England.

Northwestern States Portland Cement Co., Mason City, Iowa, has resumed operations at its Gilmore City quarry and, according to V. V. Kohl, superintendent, the plant will operate on a 14-hour instead of a 12-hour day, with a daily production of 450 tons of rock.

International Cement Corp., New York City, to improve its cement service in the South, is now producing "Incor" Perfected High-Early-Strength Portland Cement at the Spocari, Ala., mill of the Lone Star Cement Co. Alabama, one of its subsidiary companies.

Rizal Cement Co., Manila, P. I., is completing developments which will double present plant production capacity. A high-tension power line, 21 miles long, carrying 22,000-v., is being constructed by the Manila Electric Co. to supply electricity for the mill operations.

Cement Products

Claussen-Lawrence Construction Co., Augusta, Ga., recently completed a ready-mixed concrete plant at that city.

United Concrete Pipe Co., Torrance, Calif., now has its expansion program well under way. The company established its first production units two and a half years ago.

Pioneer Sand and Gravel Co., Seattle, Wash., was awarded contract for supplying 17,000 cu. yd. of ready mixed concrete for use in the construction of the West Garfield bridge, Seattle.

Cement Products Co., Libertyville, Ill., has taken over the plant formerly operated by E. C. Topel and is installing new equipment for the manufacture of cement products. Ben Stickles and George Adelhart head the enterprise.

Mon-O-Tile Concrete Products Co., Kansas City, Mo., incorporated by H. T. White and A. T. Wikersham, has acquired a 1½-acre site in the Armourdale district and will erect a plant for manufacturing interlocking concrete building block, concrete building tile and concrete brick.

Lime

Marianna Lime Products Co., Marianna, Fla., has its expansion program well under way. Contracts have been let for the following equipment: Rails, Birmingham Rail and Locomotive Co., Birmingham, Ala.; miscellaneous mill and hardware material, Woodward and Co., Ltd., New Orleans, La.; diesel engines, Fairbanks, Morse and Co., Chicago; other equipment, Standard Equipment Co., Mobile, Ala., and Alabama Machinery and Supply Co., Dothan, Ala.

Feldspar

Clyde E. Smith is now developing a feldspar deposit near Bedford City, Va. This deposit was worked in a small way for several years, but recent prospecting has shown it to be of greater magnitude than hitherto suspected.

Miscellaneous Rock Products

Arizona Rock Products Co., Tempe, Ariz., is making improvements at its plant to cost $50,000.

General Insulating and Manufacturing Co., Alexandria, Ind., is planning a three-story addition to its plant, to cost about $65,000 with equipment.

General Mica, Inc., Pueblo, Colo., has plans under way for the first unit of a new mica grinding and refining plant at Blende, Colo., to cost $30,000 with equipment. Joseph Stanko, First National Bank Bldg., Pueblo, is president.

American Agricultural Chemical Co., New York City, has opened its new phosphate mine near Alafia, Fla. A washing plant will be constructed and a large dragline installed. Construction of a high-tension power line from the main power plant at Pierce has already begun.

Personals

James Hartlage has resigned his position as superintendent of the Lilmay Stone Quarry at Stephensburg, Ky., which is operated by the Kentucky Consolidated Stone Co.

E. J. Schwanhausser, for the past two years assistant manager of the Harrison works of the Worthington Pump and Machinery Corp., has been appointed manager of the company's Buffalo works.

F. L. Farrell and **D. F. Jones**, formerly of the Schumaker-Santry Co., have become associated as Farrell & Jones and have taken over the accounts formerly handled by the Schumaker-Santry Co. Offices of the firm will be at 10 High St., Boston.

H. W. Hardinge, president of the Hardinge Co., York, Penn., sailed August 22 on the Bremen for Europe, where he will spend about three weeks on business. Mr. Hardinge expects to visit England, France and Germany.

George E. Learned has been elected chairman of the board of International Combustion Tar and Chemical Corp., New York City, succeeding F. J. Lewis. **Dr. Walter Runge** has been elected president of the same company, succeeding W. H. Lewis, and **Grant Thorn** is vice-president in charge of sales.

Robert B. Marshall, conveyor sales engineer, has joined the Chain Belt Co.'s conveyor division with headquarters at the New York City office at 50 Church St. In addition to Rex conveyors he will handle the belt conveyors, glass batch handling equipment and silo storage system of the Stearns Conveyor Co., Cleveland, a division of the Chain Belt Co. W. H. Quinn is the New York district manager for the company.

Obituaries

Lynn Spinning, superintendent of the Interstate Sand and Gravel Co., Covington, Ind., died recently at the age of 51.

Benj. S. Wykoff, Bedford, Ind., died recently at the age of 65. He was superintendent of the Blue Hole quarry for 39 years.

Edward J. Breen, Fort Dodge, Iowa, aged 66, died August 17. Mr. Breen was one of the organizers and the first vice-president of the Northwestern States Portland Cement Co., Mason City, Iowa, and was also instrumental in organizing the Lehigh Sewer Pipe and Tile Co.

Manufacturers

Sanford-Day Iron Works, Knoxville, Tenn., announce the appointment of Fred J. Moses as sales promotion manager in charge of advertising, sales promotion and publicity.

Wagner Electric Corp., St. Louis, Mo., has moved its Cleveland service station and branch sales office to 3756 Carnegie Ave.